



## **USAID/ECUADOR**

# **REPORT ON TROPICAL FORESTS AND BIOLOGICAL DIVERSITY**

## **COUNTRY STRATEGY STATEMENT**

**FY 2007 – FY 2012**

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### **DISCLAIMER**

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The opinions expressed herein are those of the authors and do not necessarily reflect the views of the Agency for International Development.

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## ACRONYMS

ABCI	Amazon Basin Conservation Initiative
CAIMAN	Conservation in Areas Managed by Indigenous Groups Project
CBD	Convention on Biological Diversity
CDC	Center for Conservation Data
CI	Conservation International
CIAT	International Tropical Agriculture Center
CIP	International Potato Center
CITES	Convention on the International Trade of Endangered Species
CLIRSEN	Ecuadorian Center for Remote Sensing
CRMP	Coastal Resources Management Project
EA	Environmental Assessment
FAA	Foreign Assistance Act
FAN	National Environmental Fund
FAO	Food and Agriculture Organization
FONAG	National Water Fund
FUNDACYT	Ecuadorian Foundation for Science and Technology
FY	Fiscal Year
GEF	Global Environmental Facility
GO	Governmental Organization
GOE	Government of Ecuador
GTZ	German Technical Assistance
IDB	Inter-American Development Bank
IEE	Initial Environmental Evaluation
IERAC	Institute for Agricultural Reform and Colonization
INDA	Ecuadorian Institute for Agricultural Development
INEFAN	National Institute of Forestry, Natural Areas and Wildlife
INIA	National Autonomous Institute for Agricultural Research
INIAP	National Autonomous Institute for Agricultural & Farm Research
IUCN/UICN	World Conservation Union
LAC	Latin America and the Caribbean
MAE	Ecuadorian Ministry of Environment
NGO	Non-Governmental Organization
OCTA	Amazon Cooperative Treaty Organization
PEA	Programmatic Environmental Assessment
PiP	Parks in Peril Program
PNG	Galapagos National Park
PRODEPINE	Project for the Development of Indigenous Peoples and Afros of Ecuador
PROINPA	Promotion & Research on Andean Products
PSUR	USAID/Ecuador Southern Border Program
RAMSAR	International Treaty on Wetlands
RTTS	Rural Technology Transfer Project
SIGAL	Inspection and Quarantine System for the Galapagos Islands
SNAP	National System of Protected Areas
SO	Strategic Objective
SUBIR	Sustainable Uses for Biological Resources Project
TNC	The Nature Conservancy
UNCGCC	United Nations Convention on Global Climate Change
UNDP	United Nations Development Program
UNEP	United Nations Environmental Program
USAID/Ecuador	United States Agency for International Development in Ecuador
WCS	Wildlife Conservation Society

WWF

World Wildlife Fund

## EXECUTIVE SUMMARY

USAID/Ecuador FAA Section 118 & 119 Report  
Biological Diversity and Tropical Forests

### **Purpose of the Report**

The purposes of this report are the following:

Comply with Sections 118 and 119 of the Foreign Assistance Act, which require that USAID/Ecuador's new Country Strategy Statement for Fiscal Years 2007 to 2012 include analyses of (1) the actions necessary to achieve conservation and sustainable management of tropical forests and biodiversity and (2) the extent to which the actions proposed meet these needs.

Guide the selection of actions for USAID/Ecuador financing that will assist Ecuador to conserve its biodiversity and tropical forests.

Recommend ways to avoid, mitigate, or compensate for the potential negative impacts on Ecuador's biodiversity and tropical forest of the actions proposed in USAID/Ecuador's new Country Strategy.

Identify opportunities for synergies among the proposed strategic objectives in USAID/Ecuador's new Country Strategy and with other Ecuadorian and donor activities that would contribute to the conservation of Ecuador's biodiversity and tropical forests.

### **Methodology and Stakeholder Participation**

A forester and an ecologist prepared the assessment during 15 days in February 2006. They consulted numerous reports, interviewed 35 knowledgeable informants, conducted a focus group discussion of Ecuadorian environmental experts, and analyzed results from 60 respondents of survey instruments, in order to assemble information on the situation of Ecuador's biodiversity and tropical forests. Time constraints did not permit field observations. USAID/Ecuador staff provided detailed comments on a draft report, which were incorporated into the final document.

### **USAID/Ecuador Strategy Statement, 2007-2012**

USAID/Ecuador's Country Strategy Statement for 2007 to 2012 proposes to finance activities in four Strategic Objectives.

***More Effective, Democratic and Transparent Local Governance:*** This Strategic Objective will further democracy in Ecuador. It will focus on three sectors: Improving local governance to better respond to citizen's needs, further decentralization of key sectors and promote local economic development and, improve civil society capacity to strengthen citizen participation, democratic values. Activities will include training and technical assistance for local governmental and civil society institutions to improve their policies, regulations, transparency, fiscal management, service delivery, and accountability. If funds become available, the program will also focus on social sectors with the most potential for decentralization, such as education and health. In the health sector, USAID/Ecuador could improve the delivery of child and maternal health services in selected municipalities, and in the education sector, USAID/Ecuador could help local governments expand the alternative/municipality-run primary schools (USAID/Ecuador, 2006).

***Sustainable Alternative Development:*** The Sustainable Alternative Development Strategic Objective will increase institutional, social, and economic stability in the Ecuadorian provinces along the Colombian border, which are vulnerable to the impacts of a growing coca/cocaine economy. The program will have four principal elements: (1) infrastructure investment, (2) citizen participation, (3) employment generation, and (4) improved local government service delivery, especially through

improved water and sanitation infrastructure. Service delivery models could also include water, sanitation and health-education (USAID/Ecuador, 2006).

**Improved Natural Resources Management, Trade and Competitiveness:** The Improved Natural Resources Management, Trade and Competitiveness Strategic Objective will promote environmental conservation simultaneously with sustainable economic growth. The program will: (1) engage stakeholders, such as landowners, tourism operators, and local and indigenous communities to conserve protected areas and indigenous territories; (2) strengthen the Ministry of Environment's ability to control deforestation and invest its own resources effectively in the management of protected areas; (3) enhance participation in global trade and investment; especially by strengthening Ecuadorian institutions that participate in global trade in order to help Ecuador meet international standards; and (4) improve private sector competitiveness of small and medium businesses, especially for environmentally-sound, income-generating activities such as agroforestry, ecotourism, and organic products for niche export markets (USAID/Ecuador, 2006).

**Southern Border Development:** The Southern Border Development Strategic Objective, which will continue only through FY 2008, will improve the social and economic conditions of inhabitants along the Peru-Ecuador border. Activities will include: (1) construction and improvement of public health infrastructure (potable water systems, sanitation units, garbage collection and recycling systems) and health and nutrition education; and (2) strengthen local communities' capabilities to secure land titles and establish natural resource management plans in the protected area of the Kutuku Mountain Range (USAID/Ecuador, 2006).

### **Context for Conservation of Biological Diversity and Tropical Forests in Ecuador**

**Geography:** Ecuador spans an area of 283,560 km<sup>2</sup> (slightly smaller than Nevada), but the combination of its equatorial location, sharp altitudinal gradients, and coastal ocean currents, have made it one of the world's ten most biologically diverse countries.

**Economy:** The extraction and export of natural resources underlie Ecuador's economy but also cause severe, long-term negative effects on Ecuador's biodiversity and tropical forests. These extractive activities could provide the financial resources required to conserve Ecuador's biodiversity and tropical forests.

**Society:** Pronounced social and ethnic divisions contribute to Ecuador's political turmoil, which complicate conservation actions and require that those actions be adapted to a wide diversity of viewpoints and cultures.

**Politics:** Political fragmentation, sectoral self-interests, and instability have blocked the approval and implementation of important conservation legislation and programs.

**Laws and Regulations:** Ecuador has a large, often contradictory, and unclear body of laws and regulations that influence conservation of its biodiversity and tropical forests and which usually are only partially enforced.

**Institutions:** The Ministry of Environment has direct responsibility for establishing environmental policies and programs although decentralization offers provincial and municipal governments the opportunity to take more responsibility for conservation. Over 60 environmental NGOs implement conservation activities. The organizations of indigenous peoples play an important role in conservation of Ecuador's biodiversity and tropical forests, since indigenous groups claim ownership over much of the remaining large, heavily forested and highly biologically diverse areas.

### **Status of Biological Diversity and Tropical Forests in Ecuador**

**Ecosystem Diversity:** Ecuador has seven broad ecosystems (forest, scrub, thorny brush, grassland, savanna, paramo, and permanently frozen ground) and 34 ecoregions.



**Species Diversity:** Ecuador has one of the world's most diverse floras, with over 16,000 species of vascular plants, 4,300 of them endemic. Eight thousand plant species (50% of total) are found in the 10 % of the country that lies between 900 and 3000 meters above sea level. Ecuador's high faunal diversity is concentrated in the Andean foothills and Amazon lowlands forests. There are 369 species of mammals, of which 30 are endemic and 6 are threatened with extinction. There are almost 2,000 bird species, concentrated in the forests of the humid lowlands and Andean slopes. Ecuadorian reptile and amphibian diversity is also high and concentrated in the Amazon lowlands, although endemic species are more common at high elevations. There are 479 species of marine fish. The flora and fauna of Galapagos, mostly endemic, are globally unique.

**Genetic Diversity:** Genetic diversity is important to the livelihoods of Ecuadorians because it involves economically important agricultural crops. The loss of natural habitat in highland areas, where wild relatives of crop species with restricted distributions occur, has contributed to the loss of genetic diversity. So has the replacement of local varieties of agricultural crops, such as potatoes, by a few more productive varieties.

**Tropical Forests Conservation:** The only recent deforestation study in Ecuador estimated that between 1991 and 2000 the deforestation rate was 198,000 hectares per year. Most area of deforestation occurred in the Amazon, but the fastest rate of deforestation occurred on the coast. Logging products is uncontrolled by the government.

### **Actions to Conserve Biological Diversity and Tropical Forests in Ecuador**

**Past Actions:** Ecuador has many decades of experience in designing and implementing policies, programs, and projects to conserve its biological diversity and tropical forests. Perhaps most successful has been its development of the National System of Protected Areas (SNAP) which includes almost 20% of the country's land area, or over 5 million hectares, in 34 protected areas. Of these protected areas, the largest and most internationally famous is the Galapagos National Park and Marine Reserve, which protects the unique flora and fauna of the Galapagos Islands. USAID/Ecuador has financed conservation activities in Ecuador since it re-opened in Ecuador in 1979, including projects in forestry, soil conservation, contamination control, protected area management, and land titling.

**Current Actions:** Current conservation actions in Ecuador focus on the delimitation and management of public and private protected areas and on existing or potential indigenous territories. International organizations, including USAID/Ecuador, have focused much of their attention on conservation in the Galapagos Islands. USAID/Ecuador is also financing the delimitation and management of territories that belong to indigenous groups in northwest Ecuador (Awa and Chachi) and the Ecuadorian Amazon (Cofan, Siona-Secoya, Huaorani, Shuar, Achuar and Quichua).

**Needed Actions:** This report identifies 25 actions needed for the conservation of Ecuador's biodiversity and tropical forests. The actions fall into the types of policy and legal, institutional, management, research, and environmental communication.

**Priority Actions:** Seven criteria (feasibility, large area, high biodiversity, sustainability, previous experience, synergy, and gaps in funding) were used to select ten priority actions for USAID/Ecuador financing between 2007 and 2012.

The assessment team recommends that four of these actions (consolidate indigenous territories, strengthen indigenous organizations, promote forest management, and promote silviculture research) be assigned to a program called "Conservation in Indigenous Territories." It recommends that four other priority actions (strengthen financing for SNAP, train SNAP staff, research key faunal species, and apply Galapagos lessons to SNAP) be assigned to a program called "Conservation in Protected Areas." Two priority actions (forest monitoring and communication of biodiversity values) support both programs.

Table A summarizes the assignment of the ten priority actions to the two programs and the types of actions.

**Table A Assignment of priority actions to conservation programs**

<b>Program/Priority Actions</b>	<b>Type of Action</b>
Conservation in Indigenous Territories	(Long-term)
(1) Consolidate indigenous territories	Policy and Legal
(2) Strengthen indigenous organizations	Institutional
(3) Promote forest management	Management
(4) Promote silviculture research	Research
Conservation in Protected Areas	(Medium-term)
(5) Strengthen financing for SNAP	Institutional
(6) Train SNAP staff	Institutional
(7) Research key faunal species	Research
(8) Apply Galapagos lessons to SNAP	Institutional
Both Programs	(Short-term)
(9) Establish permanent forest monitoring	Research
(10) Communicate biodiversity values	Communication

### **Synergies among Priority Actions**

Some of the many synergies among the priority conservation actions are listed below and summarized in Table B.

**Consolidate indigenous territories:** Land consolidation will contribute to the strengthening of indigenous organizations, is a prerequisite for forest management, and will permit accurate inventories of natural resources.

**Strengthen indigenous organizations:** Stronger indigenous organizations will be more able to obtain land titles and promote management of indigenous forestlands.

**Promote forest management:** The profits from forest management of indigenous territories could provide funds for indigenous organizations and for applied silviculture research.

**Promote silviculture research:** Applied silviculture research underlies forest management.

**Strengthen financing for SNAP:** A well-financed SNAP will be more able to resolve conflicting claims within indigenous territories, to finance a permanent training program for its staff, and to research key endangered faunal species.

**Train SNAP staff:** Trained SNAP staff will be more able to resolve superposition of the SNAP with indigenous territories and to apply Galapagos lessons to the rest of the SNAP.

**Research key faunal species:** Research on key faunal species will contribute to silviculture research and forest management.

**Apply Galapagos lessons to SNAP:** Lessons from the Galapagos will improve the management of other components of SNAP and indicate research methodologies for researching endangered faunal species.

**Establish permanent forest monitoring:** Permanent forest monitoring will contribute to the consolidation of indigenous territories, to silviculture research and to the control of logging operations.

**Communicate biodiversity values:** Communication of biodiversity values will build public support for the SNAP and for the establishment of indigenous territories.

**Table B Synergies among recommended priority conservation actions**

<b>Program/ Priority Actions</b>	<b>Potential Synergies among Priority Conservation Actions</b>
<b>Conservation in Indigenous Territories</b>	
(1) Consolidate indigenous territories	Less conflict strengthens institutions Permits forest management Reduces conflicts with SNAP
(2) Strengthen indigenous organizations	Aids consolidation of indigenous territories Increases capacity for forest management Aids forest monitoring
(3) Promote forest management	Provides funds for indigenous organizations Aids consolidation of indigenous territories Provides funds for silviculture research
(4) Promote silviculture research	Basis for profitable and sustainable forest management
<b>Conservation in Protected Areas</b>	
(5) Strengthen financing for SNAP	Permits institutional strengthening Resolve superimposition with indigenous territories Finances training program Finances research on key faunal species Permits application of Galapagos lessons
(6) Train SNAP staff	Resolves superposition with indigenous territories Permits application of Galapagos lessons to other areas
(7) Research key faunal species	Supports forest management Supports silviculture research
(8) Apply Galapagos lessons to SNAP	Supports training for SNAP staff Examples of research on faunal species
<b>Both Programs</b>	
(9) Establish permanent forest monitoring	Provides data for consolidation of indigenous territories Provides data for forest management Strengthens protection of the SNAP
(10) Communicate biodiversity values	Creates public support for SNAP Creates public support for indigenous territories Raises consciousness about biodiversity and forest conservation

### **Synergies among USAID/Ecuador Strategic Objectives**

There are many synergies among the ten priority conservation actions and other actions under the four Strategic Objectives as listed below and summarized in Table C.

**Consolidate indigenous territories:** The consolidation of indigenous territories that lie within the alternative development area will increase the satisfaction with local and national government of indigenous peoples and help to make the indigenous peoples allies in controlling illegal activities related to drugs.

**Strengthen indigenous organizations:** Strengthened indigenous organizations will be more capable of making policy contributions, monitoring the accountability of elected officials and the use of public funds, contributing to democratic debate about economic policies, and mediating conflicts.

**Promote forest management:** Promotion of forest management, in way that produces income and protects biodiversity, will contribute to the growth of local economies and the local tax base.

**Promote silviculture research:** Silviculture research will contribute to the local economy by resulting in more productive forests.

**Strengthen financing for SNAP:** The establishment of water funds that channel funds for conservation of municipal water supplies will contribute to local economic growth and local governance.

**Train SNAP staff:** Well-trained SNAP staff will improve their management of protected areas, making them more attractive for local ecotourism enterprises.

**Research key faunal species:** By contributing to forest management, research on key faunal species will contribute to strengthening the local economy.

**Apply Galapagos lessons to SNAP:** The application of lessons from the Galapagos to the SNAP will contribute to the growth of local economies.

**Establish permanent forest monitoring:** Forest monitoring system will contribute to the capability of local governments to plan and regulate the use of the forest within their jurisdictions.

**Communicate biodiversity values:** The communication of biodiversity values to local public and private decision-makers will improve local civil society and government planning for the provision of services and for local economic development.

**Table C. Synergies between priority actions and USAID/Ecuador Strategic Objectives**

Program/ Priority Action	Synergies by Program Area			
	More Effective, Democratic and Transparent Local Governance	Sustainable Alternative Development	Southern Border (only through FY08)	Improved Natural Resources Management, Trade, & Competitiveness
<b>Conservation in Indigenous Territories Program</b>				
Consolidate indigenous territories	Political stability	Political stability	More stability	More investment
Strengthen indigenous organizations	Reduced conflict Better policies Better planning	More stability	More stability	More investment
Increase technical forest management	Better products	Better products	Better products	Better products
Research silvics and silviculture	Better products	Better products	Better products	Better products
<b>Conservation in Protected Areas Program</b>				
Increase financing for SNAP	Reliable water supplies	Reliable water supplies	Reliable water supplies	More investments
Permanent training for SNAP	Improved local economy	Improved local economy	Improved local economy	Improved local economy

Program/ Priority Action	Synergies by Program Area			
	More Effective, Democratic and Transparent Local Governance	Sustainable Alternative Development	Southern Border (only through FY08)	Improved Natural Resources Management, Trade, & Competitiveness
staff				
Apply Galapagos lessons to coastal SNAP	More ecotourism	More ecotourism	More ecotourism	More ecotourism
<b>Both Programs</b>				
Establish forest monitoring system	Better municipal planning	Better municipal planning	Better municipal planning	More competitiveness
Communicate biodiversity values	More ecotourism	More ecotourism	More ecotourism	More ecotourism

### **Synergies among Priority Actions and Ecuadorian and Other Donor Conservation Actions**

There are many possibilities for synergism among the ten priority conservation actions and other Ecuadorian and donor conservation actions, listed below:

**Consolidate indigenous territories:** Consolidation of indigenous territories depends on the Ecuadorian Institute for Agricultural Development (INDA), the government agency with principal authority over land titling. The Amazon Cooperation Treaty Organization (OCTA) undertakes activities related to the consolidation of indigenous territories with which USAID/Ecuador should cooperate, particularly when the Amazon Basin Conservation Initiative (ABCI) begins operations.

**Strengthen indigenous organizations:** Actions to strengthen indigenous organizations should coordinate with the Ministry of Social Welfare and with the GTZ. OCTA works to strengthen indigenous organizations and the World Bank is funding the PRODEPINE project to strengthen indigenous organizations.

**Promote forest management:** This action should be coordinated with the Ministry of Environment, GTZ, and the IDB, all of which are involved in forest management.

**Promote silviculture research:** Ecuadorian universities should be more involved in silviculture research. The Durini Foundation has carried out silviculture research for over two decades.

**Strengthen financing for SNAP:** The Water Fund for Quito should interact synergistically with this priority action as should the GTZ municipal strengthening project and the GEF II SNAP project.

**Train SNAP staff:** The training of SNAP staff will interact synergistically with most Ecuadorian and donor projects that support the SNAP, as a better-trained staff will function more effectively.

**Research key faunal species:** Research on key faunal species should be done in coordination with Ecuadorian environmental NGOs such as Ecociencia, Jatun Sacha, San Francisco and Wildlife Conservation Society, and academic institutions that do research on forest animals.

**Apply Galapagos lessons to SNAP:** The application of Galapagos lessons to mainland areas of the SNAP should be coordinated with the Galapagos National Park (GNP), the Darwin Station, the Spanish Cooperation Agency (SCA), the World Wildlife Fund, Conservation International and The

Nature Conservancy.

**Establish permanent forest monitoring:** The Center for Remote Sensing (CLIRSEN) has digital imagery capabilities. Ecuadorian environmental NGOs such as EcoCiencia, Jatun Sacha and the Center for Conservation Data also have remote sensing experience and capabilities.

**Communicate biodiversity values:** Actions to communicate biodiversity values can draw on the conservation experiences of many Ecuadorian and international environmental NGOs.

### **Environmental Assessment of Proposed Program Actions**

USAID/Ecuador will follow the environmental review process required by 22 CFR 216 in order to identify the potential environmental impacts, including those on biodiversity and tropical forests, of the actions it proposes to finance.

The potential positive environmental impacts of these actions include: (1) protection for the watersheds that supply municipalities with water for domestic and industrial use, agriculture, and hydroelectric energy; (2) more effective government land use planning and control over the exploitation of natural resources; (3) increased government income from local taxes due to a faster growing licit, local economies that can be used to finance control of contamination and protection of biodiversity and tropical forests.

The potential negative environmental impacts of these actions include: (1) increased contamination from agricultural and industrial processes; (2) disturbance of soil and vegetation during construction activities; (3) production of medical wastes from new or improved health centers; and (4) concentration of solid and liquid wastes in social infrastructure such as schools and health centers.

Reasonable mitigation measures for these potential negative impacts are likely to be: (1) control of contamination from industrial and agricultural wastes and chemicals; (2) training in the safe use of agrochemicals, such as pesticides, and the adoption of integrated pest management practices; (3) environmental audits of processing facilities to find means to reduce contamination; and (4) construction of waste treatment and sanitary landfills concurrently with the construction of municipal water and sanitation systems.

Table D summarizes the potential positive and negative impacts on biodiversity and tropical forests of the actions proposed under USAID/Ecuador's FY 2007 to 2012 Strategy.

**Table D. Potential positive and negative environmental impacts resulting from proposed actions under USAID/Ecuador FY 2007 to 2012 Strategy Statement**

Category of Activity	Environmental Impacts		Potential Mitigation Measures
	Positive	Negative	
Improve government	Increased control	None	None
Increase economic growth	Increased conservation funds	More contamination	Agrochemical training Environmental audits
Improve health care	None	More medical wastes	Dispose wastes safely
Improve education	None	none	None
Improve conservation	Conservation of biodiversity/forests	Forest product extraction	Apply best practices
Improve water supply	Conservation of watersheds	Eliminate vegetation Disturb soil	Re-vegetate
Improve sanitation	More waste treatment	Concentration of wastes	Treat waste

## INTRODUCTION

### Purposes of the Report

The purposes of this report are the following:

- Comply with Sections 118 and 119 of the Foreign Assistance Act, which require that USAID/Ecuador's new Country Strategy Statement for Fiscal Years 2007 to 2012 include analyses of (1) the actions necessary to achieve conservation and sustainable management of tropical forests and biodiversity and (2) the extent to which the actions proposed meet these needs.
- Guide the selection of actions for USAID/Ecuador financing that will assist Ecuador to conserve its biodiversity and tropical forests.
- Recommend ways to avoid, mitigate, or compensate for the potential negative impacts on Ecuador's biodiversity and tropical forest of the actions proposed in USAID/Ecuador's new Country Strategy.
- Identify opportunities for synergies among the proposed strategic objectives in USAID/Ecuador's new Country Strategy and with other Ecuadorian and donor activities that would contribute to the conservation of Ecuador's biodiversity and tropical forests

Note, then, that this assessment is not an evaluation, program, or project design document. It does not discuss all of Ecuador's environmental issues nor does it evaluate USAID/Ecuador's past or current conservation activities. Rather, the assessment focuses on the relationship between USAID/Ecuador's Country Strategy Statement for Fiscal Years 2007 to 2012 and the conservation of Ecuador's tropical forests and biodiversity.

### Methodology and Stakeholder Participation

A team consisting of a forester and an ecologist prepared the assessment during 15 days in February 2006 in accordance with the Terms of Reference provided by USAID/Ecuador (Appendices 1 & 2). The USAID Regional Environmental Advisor for South America provided part-time assistance.

The team collected data from reports, interviews with key informants, and survey instruments. Before the initiation of the assessment, USAID/Ecuador had had received 60 responses (Appendix 3) to a survey about tropical forest and biodiversity issues which asked three questions: Where to implement conservation actions? How to implement conservation actions? How to make conservation actions sustainable?

Table 1 summarizes the categories of stakeholders that responded to the USAID/Ecuador survey. Note that the greatest number of respondents, fifteen, came from Ecuadorian environmental NGOs. There were eleven respondents from the Ecuadorian national government and nine from international environmental NGOs. There were eight respondents from Ecuadorian municipal governments, perhaps an indication of their interest in environmental issues. Only two of the respondents represented business organizations and only one represented an indigenous organization, in spite of the large numbers in Ecuador of both these categories of organizations. The survey would have been more representative if more respondents had come from these two categories.

**Table 1 Number of respondents by category to USAID/Ecuador survey on conservation issues**

Category of Respondent	Number
Ecuadorian Environmental NGOs	15

Ecuadorian National Government	11
International Environmental NGOs	9
Ecuadorian Municipal Governments	8
International Development Organizations	5
U.S. Universities	2
U.S. Government Agencies	5
Business	2
Environmental Consultants	2
Indigenous Organizations	1
TOTAL	60

The team also prepared a semi-structured survey that it used in its interviews with Ecuadorian natural resource and environment professionals (Appendix 4) and identified priority Ecuadorian conservation issues during a focus group discussion with Ecuadorian environmental experts.

Using these data, the team prepared draft recommendations for USAID/Ecuador actions to conserve Ecuador's biodiversity and natural resources. It presented these recommendations to a focus group of Ecuadorian environmental experts, recording their comments. The team presented a draft report to USAID/Ecuador. Members of the USAID/Ecuador environment team provided their written observations on the draft report and discussed them thoroughly with the assessment team. The assessment team then prepared the final report.

## USAID/Ecuador Development Strategy, 2007-2012

USAID/Ecuador's Country Development Strategy for 2007 to 2012 proposes to finance activities under four Strategic Objectives:

- More Effective, Democratic, and Transparent Local Governance
- Improved Natural Resource Management, Trade, and Competitiveness
- Sustainable Alternative Development
- Southern Border Development.

Table 2 summarizes these programmatic areas with illustrative activities.

**Table 2 USAID/Ecuador Strategic Objectives and Illustrative Activities FY 2007-2012**

Strategic Objective	Illustrative Activities
More Effective, Democratic, & Transparent Local Governance	Improve oversight and transparency practices; Improve local government management; Increase incentives for economic growth; Improve health service delivery & tuberculosis treatment Support for schools & teacher & civics training.
Improved Natural Resource Management, Trade and Competitiveness	Improve value chain efficiencies; Provide technical assistance to private sector; Finance income generating activities; Improve regulatory standards & phytosanitary requirements; Conserve protected areas & indigenous territories; Consolidate public & private protected areas; Improve urban, hydroelectric & agricultural water supplies;
Sustainable Alternative Development	Improve water and sanitation delivery; Encourage good governance & economic development; Strengthen market driven agricultural clusters; Enhance licit business opportunities & employment.
Southern Border Development	Support access to social services; Support land titling & management plans; Increase agricultural production.



Source: USAID/Ecuador FY07-FY12 Strategy, Data Sheet Drafts, USAID, 2006

### ***More Effective, Democratic, and Transparent Local Governance***

The More Effective, Democratic, and Transparent Local Governance Strategic Objective will further democracy in Ecuador. It will focus on three sectors: Improving local governance to better respond to citizen's needs, further decentralize key sectors and promote local economic development, and improve civil society's capacity to strengthen citizen participation and democratic values. Activities will include training and technical assistance for local governmental and civil society to improve policies, regulations, transparency, fiscal management, service, and accountability. If funds become available, the program will also focus on social sectors with potential for decentralization, such as education and health. In the health sector, improvements could be made in the delivery of child and maternal health services; in education, local governments could expand alternative/municipality-run primary schools (USAID/Ecuador, 2006).

### ***Sustainable Alternative Development***

The Sustainable Alternative Development Strategic Objective will increase institutional, social, and economic stability in the Ecuadorian provinces along the Colombian border, which are vulnerable to the impacts of a growing coca/cocaine economy. The program will have four principal elements: (1) infrastructure investment, (2) citizen participation, (3) employment generation, and (4) improved local government service delivery, especially through improved water and sanitation infrastructure. Service delivery models could also include water, sanitation and health-education (USAID/Ecuador, 2006).

### ***Improved Natural Resource Management, Trade and Competitiveness***

The Improved Natural Resources Management, Trade and Competitiveness Strategic Objective will promote environmental conservation simultaneously with sustainable economic growth. The program will: (1) engage stakeholders, such as landowners, tourism operators, and local and indigenous communities to conserve protected areas and indigenous territories; (2) strengthen the Ministry of Environment's ability to control deforestation and invest its own resources effectively in the management of protected areas; (3) enhance participation in global trade and investment; especially by strengthening Ecuadorian institutions that participate in global trade in order to help Ecuador meet international standards; and (4) improve private sector competitiveness of small and medium businesses, especially for environmentally-sound, income-generating activities such as agro-forestry, ecotourism, and organic products for niche export markets (USAID/Ecuador, 2006).

### ***Southern Border Development Program***

The Southern Border Development Strategic Objective, which will continue only through FY 2008, will improve the social and economic conditions of inhabitants along the Peru-Ecuador border. Activities will include: (1) construction and improvement of public health infrastructure (potable water systems, sanitation units, garbage collection and recycling systems) and health and nutrition education; and (2) strengthen local community's capabilities to secure land titles and establish natural resource management plans in the protected area of the Kutuku Mountain Range (USAID/Ecuador, 2006).

## CONTEXT FOR CONSERVATION OF ECUADOR'S BIODIVERSITY AND TROPICAL FORESTS

### Geographic Context

Ecuador has four broad geographic regions:

- Galapagos Region. The Galapagos Region, with over 120 islands and islets, lies 1,000 km to the west of the mainland on the equator. Although its few large islands (Isabela, Fernandina, Santa Cruz, Floreana, and San Cristóbal) have high volcanic mountains where enough rain falls in the rainy season (December to March) to stimulate lush vegetation, most of the islands are flat and dry.
- Coastal Region. The Coastal Region includes the flat coastal plain to the south, the Guayas River Basin and coastal mountain range in the center and the deltas of the Esmeraldas and Mataje Rivers to the north. The dry season (April to December) is longer and drier in the south than the north.
- Highland Region. The Highland Region includes the foothills on each side of the Andes rising up through montane forests and humid grasslands. In the north, the Andes divide into two parallel rows of volcanic peaks, many of them snow-covered. In the south, there are no volcanic peaks or central valley. The climate of the Highland Regions is generally drier during June to September and wetter from October to May, though rainfall varies considerably from year to year and within short distances, depending on topography.
- Amazon Region. The Amazon Region lies to the east of the Andes. The more western part of the Amazon Region, where it rains considerably throughout the year, includes rugged hills and rapidly flowing, channelized rivers. Further to the east, the topography is flat and the rivers meander, and there is a short drier season.

Ecuador's geographic diversity, its equatorial location at the juncture of two ocean currents, and the relatively recent rise of the Andean mountain range, have resulted in an extremely high level of biodiversity within the relatively small area of the country.

### Economic Context

Ecuador's economy interacts in many ways with its tropical forests and biodiversity. On the one hand, the extraction, transport and use of natural resources, although contributing to Ecuador's economic development, frequently cause severe, long-term negative effects on its biodiversity and tropical forests. In 2004, for example, while oil production contributed over US\$1 billion to the Ecuadorian Gross Domestic Product (GDP), finding, extracting, and transporting it caused the contamination of water, affecting aquatic biodiversity, and stimulated deforestation, through the construction of forest access roads. Likewise, in 2004, Ecuador produced over US\$500 million worth of bananas but their aerial fumigation likely affected the variety and populations of birds and insects (as well as humans) and monoculture banana plantations replaced more floristically diverse vegetation. Similarly, although the plywood and furniture industries provided thousands of Ecuadorians with jobs, their demand for wood stimulated the over-exploitation of some species of forest trees and the construction of forest access roads that exacerbate deforestation. Ecuador's production of canned fish, fresh-cut flowers, African palm oil, potatoes, coffee, cacao and its tourism industry contribute to Ecuador's economy. For example, the fishing industry in 2000 caught almost 600,000 metric tons and employed over 162,000 people, producing for the Ecuadorian market and exporting fresh and frozen fish, including flounder, redclaw, sardines, sea bass,

shrimp, squid, swordfish, tilapia, and tuna. Natural habits, and their biodiversity, provide environmental services of great economic value. The most important of these is the production of water, which underlies many aspects of economic development. Clean water reduces the rate of gastrointestinal diseases, for instance, which reduce people's health and, therefore, their productivity. Likewise, adequate amounts and quality of water are essential for the industrial, electrical, and agricultural production.

International tourism accounted for \$680 million of Ecuador's GDP in 2004. Many of the tourists went to the Galapagos Islands and to other components of the National System of Protected Areas (SNAP). Ecotourism has great potential for contributing to conservation although it faces the challenge of finding ways to ensure a more equitable distribution of benefits, especially to the poor people who live within or near to the protected areas. But tourism also can cause significant, long-term, permanent negative environmental impacts if not properly controlled and managed. For example, the boom in Galapagos tourism has also resulted in an increase in the rate of introduction of exotic species to the islands, some of which threaten the populations of endemic flora and fauna. Non-timber forest products (NTFP), such as edible and medicinal plants, game animals, seeds, resins and fibers, are generally important to forest dwellers but also have some commercial value. Appropriate and economically viable marketing of NTFPs, however, is often more difficult than production and management of the resource.

On the other hand, Ecuador's economy should provide financing for the conservation of its tropical forests and biodiversity. Only profitable private companies have the possibility of contributing to conservation. Oil companies, for example, must make a profit to be able to have adequate funds to invest in the infrastructure, technology, training, and monitoring that will enable them to prevent or respond to oil spills. Likewise, only profitable tourism enterprises are able to finance measures to avoid, mitigate, or compensate for the negative environmental impacts caused by their tourists. Similarly, only a strong economy will be able to provide the government with the revenue it requires to enforce regulations and provide incentives for conservation. In addition, economic growth, if equitable, may reduce the need for some of Ecuador's poor to over-exploit biodiversity and tropical forests. For example, a growing economy may enable urban dwellers to buy farm products that they otherwise could not afford. The farmers who grow those products may thus receive higher prices and sell more. They may utilize the profit to adopt technologies, such as agroforestry practices or renovation of degraded pastures that increase productivity. Increased productivity on existing farmland may serve to reduce the rate of expansion of the agricultural frontier. Farmers who invest in soil conservation may be less likely to convert forestland to farmland. In sum, although economic growth may sometimes augment the threats to Ecuador's biodiversity and tropical forests, it is also essential for their conservation, and for conservation actions to be successful in Ecuador they will require the adoption of sound policies that promote economic growth.

## Social Context

Ecuador's social diversity affects the conservation of its biodiversity and tropical forests. Although the country's population - estimated in 2004 to be 13.2 million - consists of four broad groups (Mestizo 65 %; Amerindian 25 %; Spanish 7%; and Afro-Ecuadorian 3%), within these groups there are numerous subdivisions. The Montubio culture of the Guayas Basin differs from the Mestizo culture in the highlands, Afro-Ecuadorians in Imbabura and Esmeraldas Provinces differ considerably in their cultures, and the Salasaca culture differs from the Saraguro in the south.

Amerindian groups play a particularly important role in the conservation of Ecuador's biodiversity and tropical forests since many of them control large areas of forested land. Each of these groups has a distinct culture. Table 3 shows a partial list of Ecuadorian indigenous groups.

**Table 3 Ecuadorian ethnic groups, their location, and their estimated populations.**

Indigenous Group	Predominant Province	Estimated Population <sup>a</sup>
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Awá	Esmeraldas & Carchi	2,800 <sup>b</sup>
Chachi	Esmeraldas	4,000
Tsachila	Lowland Pichincha	2,000
Otavalo	Imbabura	n.d.
Cayambe	Northern Pichincha	n.d.
Salasaca	Cotopaxi	n.d.
Cañaris	Cañar	n.d.
Saraguro	Loja	n.d.
Quichua	Napo	60,000
Cofán	Sucumbíos	800
Siona-Secoya	Sucumbíos	1,000
Shuar	Morona-Santiago	80,000 <sup>c</sup>
Achuar	Morona-Santiago	2,000
Huaorani	Napo & Orellana	2,000

Sources: <sup>a</sup>Confederación de Nacionalidades Indígenas del Ecuador (CONAIE), 1989. Las Nacionalidades Indígenas del Ecuador, Nuestro proceso organizativo. Abya-Yala, Quito; <sup>b</sup>J. Levy, pers. comm., 02/06; <sup>c</sup>D. Neill, pers. comm., 2/06.

Location, age, sex, and education further divide Ecuadorians. Inhabitants of Guayaquil and Quito, for example, compete with each, and their viewpoints differ from those of smaller cities, such as Cuenca or Manta. Although most Ecuadorians are Catholic, evangelical religions are growing in influence, sometimes causing divisions among the inhabitants of even small, rural villages. Indeed, one of the few uniting factors among Ecuadorians is the almost universal passion for playing or watching soccer and enthusiasm for the national soccer team.

Different ethnic and cultural groups tend to have distinct ways of viewing and utilizing their surroundings. Montubios, for example, work very hard to replace forest with pasture and cattle. Lowland indigenous groups, by contrast, sometimes still depend for their livelihoods on their detailed knowledge of how to exploit forest resources. The Cofán, for example, protect certain river beaches for egg-laying turtles and the Tsachilas share their knowledge of medicinal herbs with tourists while educated city dwellers generally know relatively little about Ecuadorian forests or biodiversity and highland farmers often see forests simply as a potential area for potato cultivation. Successful conservation of Ecuador's biodiversity and forests requires that conservation policies, programs, and projects consider these contrasting viewpoints of Ecuadorian citizens.

## Political Context

Ecuador's long periods of political instability since its independence from Spain in 1822 reflect its sharp internal geographic, economic, and social divisions. The coastal, commercial city of Guayaquil, for example, is a political rival of the highland administrative center of Quito. Smaller cities, such as Cuenca or Manta, compete with each other and seek more independence from the economic and political predominance of Quito and Guayaquil. Relatively long periods of economic stagnation have limited upward economic mobility, exacerbating the political tensions in a society where the majority live in poverty but a few enjoy affluence and contributing to the repeated successes in Ecuador of demagogic politicians. In 2005 and 2006, political disturbances, some of them organized by elected local officials, stopped the flow of oil through the trans-Andean pipelines, blocked the movement of vehicles on major roadways, and closed government health facilities and schools.

Since its return to democracy in 1979, Ecuador's government generally has been unable to mediate and resolve successfully these conflicts. Rather than unite the country and channel political interests into constructive action, the 1979 constitution promoted the formation of sixteen or more small, political parties, stimulating turmoil and division, and confrontation between the legislative, judicial, and executive branches of the national government. The 1998 constitution, although it did provide for decentralization of political and financial power to municipal and provincial governments,

also failed to encourage the formation of strong, effective, representative political parties. They frequently continued to represent the financial interests of their backers rather than the broader public interests. Confrontations between the three branches of the national government continued, contributing to the political instability that has seen seven presidents since in 10 years, three of them installed through force rather than by elections. The year 2006 is an election year: congressional and presidential elections are scheduled for October 2006 and the new president and deputies will take office in January 2007.

Political instability worsens the environment for economic growth, reducing employment opportunities and incomes and increasing the over-exploitation of tropical forests and biodiversity. Fishermen, for example, may capture smaller size fish or exploit more sea cucumbers and more people may turn to non-technical logging as a means to earn a living.. Political instability also makes it difficult to draft, approve, and implement conservation legislation; political turmoil, for example, has blocked new forestry, environmental, and biodiversity legislation. Thus, it has been difficult to resolve the conflicts between regulations governing land titling, national protected areas, and traditional indigenous territories and enforcement of environmental regulations has been almost impossible.

## **Institutional Context**

### ***Government Institutions***

Many Ecuadorian government institutions have responsibilities that are related to the conservation of Ecuador's biodiversity and tropical forests. At the national level, the Ministry of Environment (MAE) administrates protected areas, enforces the Forestry Law and international treaties, implements international conservation projects, and approves environmental assessments. The Ministry of Energy and Mines supervises oil production and mining, including Petroecuador, the state oil company; the Ministry of Housing and Urban Development finances and plans urban development; and the Ministry of Public Works plans and finances Ecuador's national road system. Provincial governments are concerned with road building and maintenance, activities that open new areas to colonization and increase deforestation. Municipal governments have responsibility for liquid and solid waste disposal, both of which can contaminate water and affect aquatic biodiversity. Municipal governments also provide drinking water. The diversion of rivers and construction of dams and pipelines that the construction of water systems often requires, may affect forests and biodiversity. Clean, abundant water, however, is also an environmental service that may pay for conservation. Quito's water fund (FONAG), for example, is paying part of the costs of protecting the Cayambe-Coca Ecological Reserve. Illegality and corruption contributed indirectly to threats to Ecuador's biodiversity and tropical forests by undermining the enforcement by government institutions of regulations over over-exploitation, contamination, and introduction of exotic species, and conversion of natural habitat.

### ***Environmental Non-Government Organizations***

Ecuador has more than sixty non-profit, environmental non-governmental organizations (Appendix 6). Each of these organizations has a somewhat different thematic and geographic focus. Some, such as Jatun Sacha, establish, protect, and study small, natural areas. Others, such as ECOLEX and CEDA, try to improve the legal aspects of conservation. Some of Ecuador's environmental NGOs are large, such as Fundación Natura. Others may consist of only a relatively few people working on a specific environmental problem in a restricted geographic area, such as the San Francisco Foundation in Loja.

### ***Businesses***

Many Ecuadorian businesses earn profits by extracting and processing natural resources. The extraction and processing methods used frequently have negative impacts on Ecuador's

biodiversity and tropical forests. National and international companies involved in oil production, mining, tourism, agribusiness, and the wood industry, for example, can stimulate deforestation, cause contamination, over-exploit flora and fauna, and introduce exotic species. Oil is particularly important to Ecuador's economy. Oil exploration, extraction, transport and processing can cause large-scale, permanent direct and indirect negative impacts on biodiversity and tropical forests. The three largest negative impacts associated with the oil industry in Ecuador are contamination of water due to oil spills, deforestation associated with penetration roads into previously inaccessible forested areas, and degradation of indigenous cultures, through contact with the cash economy. The national oil company is Petroecuador while the principal multinational oil companies with Ecuadorian operations include Occidental, REPSOL, PETROBRAS, ENCANA and the recent arrival of a Chinese company. Tourism companies, by contrast, tend to be locally controlled, although some have links to international operators. There are two large wood industry groups in Ecuador, Durini and Alvarez-Barba, and hundreds of smaller, formal and informal wood-using enterprises. Formal, for-profit businesses have established representative organizations in the wood, banana, cacao, milk, coffee, sugar cane, shrimp, short-cycle crops, African palm, oil, and tourism sectors. These organizations are influential in establishing sector policies and thus influence policies that affect biodiversity and tropical forests.

### **Organizations of Indigenous Peoples**

Ecuador's many organizations of indigenous peoples, at the national, regional, and local level, affect biodiversity and tropical forests. Indigenous organizations tend to splinter rather than consolidate, often as a result of manipulation by outside interests. Indigenous organizations have a profound impact on the conservation of biodiversity and forests as they represent the landowners of over four million hectares, much of it in the biodiversity rich Amazon Region. Table 4 provides a partial list of Ecuadorian indigenous organizations and their acronyms.

**Table 4 Partial list of Ecuadorian indigenous organizations and their acronyms**

<b>Organization</b>	<b>Acronym</b>
Confederación de Nacionalidades Indígenas del Ecuador	CONAIE
Consejo de Pueblos y Nacionalidades Indígenas del Ecuador	CODENPE
Confederación de Pueblos de la Nacionalidad Quichua del Ecuador	ECUARUNARI
Confederación de Nacionalidades Indígenas de la Amazonia Ecuatoriana	CONFENIAE
Federación de Comunas Unión de Nativos de la Amazonia Ecuatoriana	FECUNAE
Federación Ecuatoriana de Indígenas Evangélicos	FEINE
Federación Nacional de Organizaciones Campesinas, Indígenas y Negras	FENOCIN
Federación de los Centros Awá del Ecuador	FCAE
Federación Indígena y Campesino de Imbabura	FICI
Federación de Organizaciones Indígenas de las Faldas del Chimborazo	FOCIFC
Movimiento Indígena y Campesino de Cotopaxi	MICC
Organización de Pueblos Indígenas de Pastaza	OPIP
Unión de Organizaciones Campesinas Indígenas de Cotacachi	UNORCAC
Federación de la Nacionalidad Indígena Cofán del Ecuador	FEINCE
Federación de la Nacionalidad Indígena Huaorani del Ecuador	ONHAE
Federación Independiente del Pueblo Shuar del Ecuador	FIPSE
Organización Shuar del Ecuador	OSHE
Federación Interprovincial de Centros Shuar	FICSH
Federación Interprovincial de Nacionalidad Achuar del Ecuador	FINAE

Source: various web pages

## Legal Context

### ***Environmental Laws and Regulations***

Ecuador is a signatory to many laws, regulations and treaties that should serve to conserve its biodiversity and tropical forests (Table 5). While there remain important gaps and contradictions in laws and regulations affecting the conservation of biodiversity and tropical forests, a principal constraint is the lack of effective enforcement of the existing laws. Frequently these laws, regulations, and treaties are less than fully enforced, leaving Ecuador's biodiversity and tropical forests more threatened than they should be.

**Table 5 National Environmental Laws and Regulations and International Conventions**

<b>Law, Regulation or Convention</b>	<b>Category</b>	<b>Content</b>
Ley de Gestión Ambiental (Ley No. 37, RO/245 de 30 de julio de 1999)	Primary environmental law (www.ambiente.gov.ec)	National law governing environmental principles and policies.
Ley Forestal y de Conservación de Áreas Naturales y Vida Silvestre (Ley No. 74 RO/64, 24 de agosto 1981)	Primary forest resource law for Ecuador (www.ambiente.gov.ec)	National law governing forest protection and management.
Ley Especial Para La Provincia de Galápagos (Ley No. 67 RO/278, 18 de marzo de 1998)	Primary law governing natural resource conservation & development (www.ambiente.gov.ec)	National law governing sustainable management for the Galapagos Province, including the fisheries resource.
Ley de Prevención y Control de Contaminación Ambiental (Decreto Supremo No. 374 RO/97 de 31 de mayo de 1976)	Primary law governing air and water contamination (www.ambiente.gov.ec)	National law governing air and water contamination.
Ley de Aguas (DS 369, RO 69; 30 de mayo de 1972)	Primary law addressing water quality (www.mineriaecuador.com)	National law governing water quality and water contamination.
Ley de Prevención y Control de Contaminación Ambiental (DS 374, RO 97: 21 de mayo de 1976)	Primary law addressing air quality.	National law governing air quality and air contamination.
Decreto #1306, 27 de agosto de 1971 (Ley de Parques Nacionales y Reservas; RO 301)	Primary Government decree governing national parks and reserves.	Decree governing the structure, operation, and management of national parks and reserves.
Declaración de Patrimonio Natural de la Humanidad	UNESCO World Heritage List (www.unesco.org)	4 Ecuador sites: City of Quito (1978); Galápagos Islands (1978/2001); Sangay N.P. (1983); Historic Center of Santa Ana de los Ríos de Cuenca (1999)
Convention on International Trade of Endangered Species (CITES)	International Agreement (www.cites.org)	Key agreement on control of endangered species.
RAMSAR Convention	International Agreement (www.ramsar.org)	Convention on wetlands of international importance for waterfowl. Includes 11 areas.
Convention on Biological	International Agreement	Convention of conserve

<b>Law, Regulation or Convention</b>	<b>Category</b>	<b>Content</b>
Diversity	( <a href="http://www.biodiv.org">www.biodiv.org</a> )	biodiversity.
UN Convention to Combat Desertification	International Agreement ( <a href="http://www.unccd.int">www.unccd.int</a> )	Convention to combat desertification world-wide.
The Vienna Convention for the Protection of the Ozone Layer (1985)	International Agreement ( <a href="http://www.unep.ch/ozone">www.unep.ch/ozone</a> )	Convention to minimize the destruction of tropospheric ozone.
Convention for the Prevention of Pollution From Ships (MARPOL 1973/1978)	International Agreement ( <a href="http://www.imo.org">www.imo.org</a> )	Convention to minimize and/or prevention pollution from ships.

Source: Various web pages as indicated in the table

### **Forestry and Conservation of Natural Areas and Wildlife Law**

(Ley Forestal y de Conservación de Áreas Naturales y de Vida Silvestre)

The existing and current Forestry Law dates from 1981. The law assigns ownership and control of all forest resources to the national government. The provisions of the 1981 law, however, were never fully implemented and many substantial changes in the administration and control of Ecuador's forests have been made by the Ministry of Environment. The Forestry Law provides the legal basis for the National System of Protected Areas (SNAP), the protected area system that was created under the 1998 Constitution, Article 86. A new Forestry Law, based largely on the examples of Chile and Costa Rica, was prepared in 2001 but remains unapproved.

### **Environmental Management Law**

(Ley de Gestión Ambiental)

The Environmental Management Law, although passed by the Ecuadorian Congress, has never had its regulations approved by the President's Office and so has never been implemented. Instead, the Ministry of Environment has implemented the Unified Environmental System (SUMA). SUMA permits the Ministry of Environment to accredit other public agencies as environmental authorities. As of February 2006, the municipalities of Quito and Cuenca, the Provincial Government of Loja, the Ministry of Mines and Energy, and the National Council of Electrification had received such accreditation. Of the 60 environmental licenses that the Ministry of Environment issued in 2005, almost all involved oil, electricity, transportation, and irrigation projects. The principal problems in the regulations governing environmental impact studies are the lack of (1) regulations for the Ley de Gestión Ambiental; (2) sufficient personnel to review, evaluate, and monitor the environmental impact studies; (2) sufficient training in enforcement of environmental regulations. The World Bank and the Government of Holland are both providing support to the MAE for improvements in its environmental impact study procedures.

### **Biodiversity Law**

Discussions regarding a Biodiversity Law began approximately in 2000 and the law was approved by the Congress in a first debate in 2002. In 2004 a coalition of indigenous groups and environmental activists killed the law in its second debate, although USAID/Ecuador, TNC, and many Ecuadorian environmental NGOs supported it. Since then there has been no further attempt to approve the law. The National Confederation of Ecuadorian Indigenous Organizations (CONAIE) is drafting their own version of a biodiversity law, although the majority of its provisions overlap those of the draft Biodiversity Law of 2002.

### **Convention on Biological Diversity**

Ecuador is a signatory to the Convention on Biological Diversity (CBD) and has prepared a National Strategy for the Conservation of Biological Diversity. The heart of this strategy is the consolidation of the National System of Protected Areas (SNAP) in order to protect the entire range of Ecuador's



native ecosystems and conserve biodiversity “in situ” as recommended in Article 8 of the CBD.

### **Convention on International Trade in Endangered Species**

The Convention on International Trade in Endangered Species (CITES) is an international treaty administrated by the United Nations that is integral to the World Conservation Strategy of the United Nations Environmental Program (UNEP). The objective of CITES is to prevent, regulate, control and sanction the international trade of threatened or endangered species of flora and fauna. CITES Appendices I, II, III allude to threatened species that are or could be affected by trade, those that could be affected if strict control measures are not taken at an international level, and those that are subject to special regulations within each country, with the purpose of restricting or preventing their exploitation.

Ecuador subscribed to CITES in Dec 1974. The administrative authority is the Ministry of the Environment and the scientific authorities are numerous designated academic institutions (universities and museums) around the country and environmental NGOs (e.g. EcoCiencia, Charles Darwin Foundation).

### **Convention on Global Climate Change**

Ecuador has signed the United Nations Convention on Global Climate Change (CMNUCC) and the Kyoto Protocol on Climate Change. In order to provide the institutional means to comply with Ecuador's commitments under these agreements, the government has established a Climate Change Unit of the Ministry of Environment. The Unit coordinates with a National Committee for Climate Change and the Corporation for Clean Production to implement the National Process of Climate Change. This process contains four components: augmented institutional capacity; analysis of climate change's impacts on Ecuador; defining alternatives for responding to climate change; and meeting international commitments under global agreements. The Climate Change Unit has produced, with financing from the project GEF-PNUD ECU/99/G31, the National Communication on Climate Change, which summarizes the problems of climate change as they affect Ecuador and the national strategy for mitigating these problems.

### **RAMSAR Convention**

In January 1991, Ecuador demonstrated its commitment to wetland conservation by ratifying the RAMSAR Convention. The Government of Ecuador sponsored the pilot phase of the National Inventory of Ecuadorian Wetlands and created the category of wetlands within the Forestry and Natural Areas Law. It has also created the National Wetlands Working Group, with representatives of a wide range of economic interests and social groups, that is developing a National Strategy for Wetlands that is expected to be sent to the Office of the Presidency for consideration during 2006 (S. Lasso, pers. comm.). There are currently eleven RAMSAR Sites in Ecuador, the majority of them in coastal habitats (Table 6). Coastal wetland sites support the conservation of biological diversity, for example, the Cayapas-Mataje Ecological Reserve protects a mangrove ecosystem with crabs and shellfish that are sought after by local human populations, but their waters are not apt for human consumption. The only Andean wetland in Ecuador recognized by RAMSAR is in Cajas National Park, a strategic water resource for Cuenca. The twelfth potential RAMSAR site in Ecuador, in Cayambe-Coca National Park, would be the second recognized Andean wetland and one that provides drinking water for the city of Quito.

**Table 6 Ecuadorian RAMSAR sites, establishment date, province, and area**

Site	Date established	Province	Area (ha)
Abras de Mantecilla	14/03/00	Los Ríos	22,500
Humedales del Sur de Isabela	17/09/02	Galápagos	872
Isla Santay	31/10/00	Guayas	4,705
La Segua	07/06/00	Manabí	1,836
Laguna de Cube	02/02/02	Esmeraldas	113
Machalilla	07/09/90	Manabí	14,430
Manglares Churute	07/09/90	Guayas	35,042

Site	Date established	Province	Area (ha)
Parque Nacional Cajas	14/08/02	Azuay	29,477
Refugio de Vida Silvestre Isla Santa Clara	02/02/02	El Oro	46
Reserva Biológica Limoncocha	10/07/98	Sucumbíos	4,613
Reserva Ecológica Cayapas-Mataje	12/06/03	Esmeraldas	44,847

Source: Ecuadorian Ministry of the Environment, 2005

## Land Ownership Context

Categories of land ownership affect the possibilities for conservation. Decisions about the use of publicly owned land, such as national protected areas, for example, are made very differently than decisions about the use of communal indigenous lands or private lands. Conservation of biological diversity and tropical forests thus occurs within the context of land ownership. Land ownership in Ecuador includes communal lands, private lands, and government land.

### Public Land

Over 20 percent of Ecuador is public land. The largest area of public land is included in the SNAP, which presently includes over 19 % of Ecuador's surface area (over 5 million ha) in national parks and ecological reserves. Table 7 indicates the categories, numbers, names, and areas of the protected areas included in the SNAP (see Appendix 5 for more information about each of these protected areas, including management plan status).

The oldest protected area in Ecuador is Galapagos National Park, established in 1936 while the most recent are smaller protected areas (Isla Corazón, Parque-Lago, El Salado, La Chiquita and Estuario Río Muisne), all established in 2002 and 2003. The largest protected area is the Galapagos Marine Reserve (7,000,000 ha) and the smallest is Santa Clara Island Wildlife Refuge (46 ha).

UNESCO has declared both the Galapagos National Park and Sangay National Park as National Patrimony for Humanity and the Yasuní National Park as a Biosphere Reserve. The Sumaco National Park and the Cayambe-Coca and Antisana Ecological Reserves are both included within the area of the Gran Sumaco Biosphere Reserve. The Ministry of Environment has overall responsibility for the protection of these areas, although it is beginning to share management responsibilities with municipalities and private organizations.

Note, however, that there is a great deal of overlap between the areas in the SNAP and private and indigenous lands. Many of the protected areas were superimposed on private lands and on traditional indigenous territories. To obtain unambiguous rights to these areas the Ecuadorian government would have to buy the land from its private and indigenous owners.

**Table 7 Areas included in the National System of Protected Areas of Ecuador (SNAP)**

Category of Protected Area	Number	Protected Area and Number of Hectares
National Parks	9	Cajas (28,808), Cotopaxi (33,393), Galápagos (693,700), Llangantes (219,707), Machalilla (56,184), Podocarpus (146,280), Sangay (517,765), Sumaco (205,249), Yasuni (982,000)
Ecological Reserves	11	Antisana (120,000), Arenillas (17,082), El Angel (15,715), Cayambe-Coca (403,103), Cayapas-Mateje (51,300), Cofan-Bermejo (55,451), Cayapas-Mataje (61,713), Cotacachi-Cayapas (243,638), Los Ilinizas (149,900), Machi-Chindul (119,172), Manglares Churote (49,894)
Geobotanical Reserves	1	Pululahua (3,383)
Recreation	2	El Boliche (400), El Logo (2,283)

Category of Protected Area	Number	Protected Area and Number of Hectares
Areas		
Biological Reserves	1	Limoncocha (4,613),
Fauna Production Reserve	3	Cuyabeno, El Salado, Chimborazo
Wildlife Refuge	1	Rio Muisne
Bi-national Park	1	El Condor
Marine National Park	1	Galapagos (14,110,000)

Source: Análisis de las necesidades de financiamiento del Sistema Nacional de Áreas Naturales Protegidas del Ecuador. MAE, 2005.

### **Communal Land**

Communal land ownership is common in Ecuador although no data were available on their extent, location, or vegetative cover. Many indigenous and Mestizo groups in the Highland Region, for example, own communal *paramo* that lie above their individually owned land holdings at lower elevations. They usually use communal land pasture and individually owned land for agriculture. Likewise, in northwest Ecuador indigenous groups, such as the Tsachila, Awa, and Chachis, and Black groups, and further south in Manabi and Guayas Provinces, there communal lands are common. Forest still covers much of Ecuador's communally owned land.

### **Private Land**

Small and large private properties in the Coastal, Highland, and Amazon Regions frequently still have patches of natural habitat, whether it is forest, mangrove, *paramo*, or some other vegetation type that protects biodiversity. A study by the Ecuadorian Center for Remote Sensing (CLIRSEN, 2003) found that much deforestation is occurring through the elimination of the forest that remains on private landholdings. Every year landowners clear a little more of the remaining forest in order to expand their property's area of agriculture or pasture. Actions to reduce the rate of habitat elimination of private properties, therefore, would help to conserve tropical forests and biodiversity.

Many private protected areas have been established in Ecuador over the last few decades although no data are readily available on their area and location. NGOs such as the Jatun Sacha, Maquipucuna, and the San Francisco Foundations own a number of private reserves. Some others, such as the Rio Palenque Science Center and the Cerro Blanco Reserve, are owned by companies. Although they are usually relatively small areas, such small, private reserves can offer an excellent means to conserve some representative samples of biodiversity and tropical forests, since they can obtain donations from private foundations, be managed efficiently and effectively, and frequently have clear land titles.

### **Urban Land**

There is little chance to prevent the urbanization of land around cities and towns and the consequent elimination of habitat. It is possible, however, to maintain habitat in urban areas that will increase urban biodiversity. Parks, street trees, and gardens provide opportunities to maintain some diversity of plants and animals in an urban environment. Such biodiversity, although perhaps relatively unimportant from the scientific viewpoint, can contribute to human welfare by providing more aesthetic, pleasant, and healthy living conditions and increasing public consciousness of the value of plants in the environment.

## **Indigenous Land**

Indigenous territories cover over 4 million hectares in Ecuador and are largely still covered with forest. They are, therefore, strategic for the conservation of biodiversity and tropical forests. Until 1998, Ecuador had a judicial system that gave indigenous land rights an ambiguous status. In 1969, Ecuador ratified Convention 107 of 1957 in which it made the commitment to recognize indigenous property rights in their traditionally occupied lands. Subsequently, the Law of Cooperatives, the Regulations for the Adjudication of Empty Lands (Tierras Baldias), the Law of Colonization of the Amazon, and the Agricultural Development Laws (1994 & 1997) recognized the responsibility of the government to acknowledge the rights of indigenous communities to their traditional lands and ways of life.

As Ecuador has never approved specific regulations for titling indigenous lands, the Institute for Agricultural Reform and Colonization (IERAC) proceeded to distribute "tierras baldias" (empty land) to colonists, even though most of these lands were traditional indigenous territories. Some land titles, however, were given to indigenous "centers" and, at the end of the 1990's, to "ethnic territories." These ownership forms provide a legal model for the management and administration of indigenous lands that was suited to the traditional organization and way of life of indigenous peoples. In particular, all these forms of land tenure permitted the sale and transfer of land titles of indigenous lands to others, according to the provisions of the Civil Code.

The Constitution of 1998 introduced a radical change in Ecuador's policy towards indigenous peoples in general and towards their land rights specifically. It gave indigenous peoples the collective right to conserve the title to their lands without permitting their transfer to third parties and to obtain their ancestral possession of community lands free, overriding the provisions of all previous laws and regulations. In 1998, Ecuador also ratified Convention 169 of 1989 of the International Organization of Labor. The Ecuadorian state thus accepted an international obligation to recognize and title indigenous territories. Since Ecuador has not prepared or approved the new regulations that are required to implement the provisions of the 1998 Constitution or Convention 169, however, it continues to apply the old regulations to tenure questions over indigenous lands.

In addition, Ecuadorian law gives the state ownership and control over forested lands and to subsurface natural resources, such as oil. For these reason, indigenous territories have remained in legal and administrative ambiguity, not only retarding the resolution of numerous existing conflicts over the ownership and boundaries of indigenous territories but also fostering the creation of new conflicts. These conflicts over land tenure, moreover, weaken the effectiveness and credibility of indigenous organizations. They provide opportunities for the purposeful creation of internal conflicts in the indigenous organizations, which serve to advance interests that are often in opposition to those of the indigenous peoples themselves. Consequently, in order to comply with its international obligations and the provisions of the 1998 Constitution, Ecuador urgently needs to adopt a general regulation that would establish the means and methods for ensuring secure tenure and administration of indigenous territories (Rodan, 2005).

## **Conservation Issues**

The assessment team, based on its discussions with Ecuadorian environmental experts, identified eight issues and related questions that will influence USAID/Ecuador's selection and implementation of actions needed to conserve Ecuador's tropical forests and biodiversity.

## **Conservation vs. Poverty Alleviation**

The inhabitants of Ecuador's biologically rich tropical forests tend to be poor, not only as measured in their cash income but also in their inadequate health, education, shelter and nutrition. Some of their economic activities, moreover, such as agriculture, livestock, and hunting, often threaten biodiversity and tropical forests; indeed, some of them view the forest as an obstacle to an improved standard of living. How, then, can tropical forests and biodiversity contribute to poverty alleviation? Can improved marketing of the products and services that originate in tropical forests benefit their inhabitants? Will such financial benefits provide an incentive for people to conserve rather than destroy tropical forests? What lessons has USAID/Ecuador learned from its previous

and current conservation projects? What has it learned about the relationship between increased local financial benefits from the conservation of biodiversity and tropical forests?

### ***Centralization vs. Decentralization***

Ecuador has been going through a process of decentralizing government responsibilities, including those related to the protection of the environment. The Ministry of Environment, for example, has delegated some of its responsibility for control of contamination to municipal governments. Yet the most effective assignment of responsibilities remains unclear. What level of government, national, provincial, municipal, or parish, should take responsibility for what type of conservation action? Should provincial and municipal governments promote forest management? What level of government should collect and analyze deforestation data? How can different levels of government cooperate? On what types of activities should they coordinate? On what experiences can USAID/Ecuador draw to determine the most effective level of government for the activities it finances?

### ***Public Actions vs. Private Actions***

Ecuadorian public and private institutions that affect conservation tend to be antagonistic. The Ministry of Environment, for example, tends to view the wood industry as the object of its control while the wood industry uses its influence to weaken control over their logging operations. Likewise, some oil and mining companies view environmental protection as a bureaucratic requirement involving the approval of paperwork more than a worthwhile activity. Yet cooperation between the public and private sectors could result in effective conservation actions. What are the best roles in Ecuador for public and private sectors in conserving tropical forests and biodiversity? In the private sector, what are the best respective roles for non-profit and for-profit organizations? How can businesses, such as oil and plywood companies, both extract and process natural resources and help to conserve tropical forests and biodiversity? How can the public and private sectors best work together to resolve conflicts over the use of natural resources and achieve conservation goals? What previous experiences can USAID/Ecuador draw on to design and implement conservation actions that best utilize the relative strengths of the public and private sectors?

### ***Incentives vs. Regulations***

Ecuador public institutions tend to turn to regulations to conserve biological diversity and tropical forests. Yet regulations often do not exist or are contradictory. Moreover, public institutions generally lack sufficient personnel and funds to enforce regulations. Consequently, regulations, rather than helping conservation frequently offer opportunities for corruption. Effective enforcement of regulations is unlikely to occur soon. So in what situations are incentives or regulations the most effective means of achieving conservation of tropical forests and biodiversity? Under what circumstances will private, for-profit businesses, such as wood using industries, respond adequately to incentives for forest conservation? How can regulations over the use of tropical forests and biodiversity, such as logging, function in a country where the judicial system has become extremely weak? Do previous USAID/Ecuador experiences indicate how to help Ecuador make environmental regulations effective?

### ***Action vs. Data***

The data on deforestation in Ecuador are generalized and out-of-date, making them almost useless as a basis for formulating policies and programs. How is possible to design, implement, monitor, and evaluate conservation actions on the basis of inadequate data? What is the best institutional structure to collect data on biodiversity and tropical forests? Should USAID/Ecuador allocate limited conservation funds to collect this type of data? Or is worthwhile to fund other conservation actions when available baseline data may provide an insufficient basis for making timely and appropriate decisions?

***Field Activities vs. Policy Activities***

Some conservation actions involve working in the field to directly conserve biodiversity by, for example, implementing low-impact logging practices or patrolling national protected areas. Other conservation actions involve improving the policies that affect conservation. Revising forestry regulations, for example, may improve forest management in large areas of Ecuador's forests. What is the best mix of field vs. policy activities? Should USAID/Ecuador finance policy studies, which, although they may eventually promote conservation over large areas, do not directly affect the lives of local people? Or should it finance specific field activities that may directly benefit poor people but whose scope may be limited? What experiences can USAID/Ecuador draw on to achieve a reasonable mix of field and policy activities?

***Long-Term vs. Short-Term Results***

Conservation actions may yield results in the short or long term. Either short or long-term results, however, may yield small or large conservation benefits. Presumably, USAID/Ecuador would like to achieve significant conservation results with the least expenditure of time and funds. Which kind of conservation actions will yield the greatest conservation benefits? Are short-term results necessarily less sustainable than longer-term results? Can USAID/Ecuador draw on its experience to choose between actions that yield short vs. long-term results?

***Innovation vs. Experience***

Innovative conservation actions may have the appeal of offering new solutions to old conservation problems. Yet some well-known conservation actions may be tried and tested and proven to work. The importance of land titling, for example, although not a panacea for conservation, certainly is a necessary first step to the protection and management of a forested area with a high level of biodiversity. How should decisions be made between using innovative or tested approaches to conservation? Is innovation preferable in and of itself? What then should be the mix between innovative and tested approaches to conservation? How much should risk should USAID/Ecuador take in supporting innovative, but untested approaches to conservation? How much should it examine past experiences for successful approaches to conservation and continue to finance them?

## STATUS OF ECUADOR'S BIODIVERSITY AND TROPICAL FORESTS

Biological diversity means the number and variety of living organisms found in an ecological community, habitat type, region or country. It includes ecological diversity, species diversity and genetic diversity. Ecuador is renowned for being a country with some of the highest biological diversity and species endemism in the world. The broad range of ecosystems across a relatively small country has, in turn, facilitated the evolution of high levels of species diversity. The natural vegetation of most of the regions of continental Ecuador, including coast, highlands and the Amazon, have been reduced to less than 50% of their original extension (MAE, EcoCiencia & UICN 2001).

### Ecosystem Diversity

Many classification schemes have been developed to describe terrestrial ecosystems. On a national scale, it is appropriate to use the vegetation classification system for continental Ecuador proposed by Sierra (1999a) that is comprised of three hierarchical levels (Table 8). The first level considers the physiognomy of the vegetation, the second level both environmental (climate) and biotic criteria, and the third level incorporates topography into the classification of ecoregions.

**Table 8 Ecoregions of continental Ecuador**

Physiognomy	Environmental	Topography	Ecoregion
Forest	humid evergreen	lowland	Lowland evergreen forest
		foothill	Foothill evergreen forest
		low montane	Low montane evergreen forest
		high montane	High montane evergreen forest
	flooded evergreen	lowland	Lowland flooded evergreen forest
		lowland	Whitewater flooded forest
		lowland	Blackwater flooded forest
	flooded palm	lowland	Lowland flooded palm forest
	dry deciduous	lowland	Lowland deciduous forest
	semi-deciduous	lowland	Lowland semi-deciduous forest
		foothill	Foothill semi-deciduous forest
		low montane	Low montane semi-deciduous forest
	cloud evergreen	low montane	Low montane cloud forest
		montane	Montane cloud forest
	mangrove		Mangrove forest
Scrub	humid evergreen	foothill	Humid foothill scrub
		low montane	Humid low montane scrub
		montane	Humid montane scrub
	dry evergreen	coastal	Dry coastal scrub
		lowland	Dry lowland scrub
		montane	Dry montane scrub
Thorny brush		coastal/lowland	Coastal thorny brush
		montane	Montane thorny brush
Grassland	humid evergreen	lowland/lake	Lowland lake grassland
		montane/lake	Montane lake grassland
		high montane/lake	High montane lake grassland
		lowland/riparian	Lowland riparian grassland
Savanna			Savanna

Physionomy	Environmental	Topography	Ecoregion
Páramo	humid		Herbaceous páramo
	herbaceous/ <i>Puya</i>		Páramo with <i>Puya</i> spp.
	humid/cushion plants		Páramo with cushion plants
	humid/shrubs		Shrubby páramo
	dry		Dry páramo
Frozen			Frozen ground

Source: Sierra 1999a

## Species Biodiversity

### Floral Diversity

About 16,000 species of vascular plants are estimated for Ecuador, of which almost 72% are native and about 27% are endemic (Moller Jorgensen & León 1999). In general, the geographic distribution of plant collections corresponds with roads and navigable rivers. As remote wilderness areas are better studied and collected, it is likely that the total number of plants in Ecuador will reach 20,000 species.

Approximately half of all the plant species in Ecuador grow between 900-3000 m elevation although this represents only 10% of the total area of the country. From 900 m to the snow line there are 9,865 vascular plant species, making up 64.4% of the national total (Moller Jorgensen & León 1999). According to Sierra (1999a), this swath of the Andes is comprised of 20 ecoregions or natural formations, a number greater than either the coast or the Amazon. Biological diversity found across different habitat types in the landscape is often referred to as beta diversity and can generate high overall diversity patterns. This is different from high alpha diversity that represents extraordinary species richness at a single site or habitat type

The plant diversity and endemism in the Andes (Table 9) reflects the geological history, particularly the relatively recent (in evolutionary history) Andean uplift, the formation of the Panama land bridge connecting the large land masses of the American continents, and significant climate fluctuations during Pleistocene and Holocene glacial and inter-glacial periods (as recently as 10,000 yrs ago). The diverse present-day vegetation of montane forests on Andean slopes and valleys reflects genetic input from distant north and south latitudes as well as lower and higher altitudes. In the southern Ecuadorian Andes, where mountaintops do not pass 4000 m elevation, the different vegetation types are usually found at lower elevations than in the north. As well, the Andes to the south of 2°30', Azuay and Loja Provinces, are geologically and floristically different than the mountains to the north. For example, species in the families *Podocarpaceae* and *Proteaceae* are only found in the southern region.

**Table 9 Plant endemism in the Ecuadorian Andes**

Family	No. of endemic spp.	% of the total number of endemics	% of the total of spp. of the family in the country
Asteraceae	251	19.9	44.1
Orchidaceae	217	17.2	29.2
Melastomataceae	108	8.5	62.4
Campanulaceae	73	5.8	61.8
Bromeliaceae	58	4.6	44.6
Ericaceae	48	3.8	40.0
Scrophulariaceae	46	3.6	38.6
Piperaceae	42	3.3	38.1
Rubiaceae	29	2.3	26.1
Solanaceae	24	1.9	16.5
Fabaceae	20	1.6	17.6



Family	No. of endemic spp.	% of the total number of endemics	% of the total of spp. of the family in the country
other 72 families	345	27.5	7.8
Total	1,261	100	

Source: MAE, EcoCiencia & UICN, 2001

Palms are found throughout Ecuador from sea level to 3500 m elevation where the wax palm (*Ceroxylon parvifrons*) grows. There are 29 genera and 120 species of native palms in Ecuador. Although the area of Ecuador is just 2% of the area of South America, the country harbors 53% of the genera and 15% of all the species of native palms found on the continent. The most diverse genera are *Geonoma* (30 species), *Bactris* (16 spp.), *Wettinia* (14 spp.) and *Aiphanes* (11 spp.); 13 genera have only one species. Sixteen palm species are endemic to Ecuador and of those, seven have geographically very restricted populations that threaten their survival, especially those in the southeastern part of the country (Valencia et al. 1998).

The coastal region of Ecuador is made up of many different ecosystems and microhabitats due to orographic formations such as the low-lying mountain ranges (max. elevation about 800 m) of Mache-Chindul, Cojimíes, Jama, Chongón-Colonche, Churute and Molleturo, the extensive Guayas and Esmeraldas watersheds, and the Andean foothills. The natural vegetation formations of the northern coast are primarily the humid evergreen forests, humid semi-deciduous forests and mangroves of Esmeraldas Province. The humid forests of northern Esmeraldas comprise the southernmost limit of the renowned species and endemic-rich Chocó forests and the remaining forest continues to be under tremendous threat of land conversion (for agriculture, cattle, African palm plantations) and over-exploitation (creaming or selective harvest) of economically-valuable timber species. The only remaining large tract of intact forest in this region is within the Awá territory and is under pressure by African palm and logging companies. The southern coast has remnant patches of dry forests, from Puyango at the Loja-El Oro Provincial limit to Machalilla National Park that forms part of the Chongón-Colonche coastal range. These dry forests are now extremely fragmented and limited in area.

The Amazon region of Ecuador has registered 4,857 plant species (31.7% of the national total) (MA, EcoCiencia & UICN 2001). It should be noted that the floristic diversity of the Amazon region is lower than both the coast and the highlands if the area of natural vegetation is taken into consideration; the natural forest of the Amazon obviously covers a much larger area than natural vegetation in either of the other two regions. Alpha diversity (no. of species in a specific locality) is very high in the Ecuadorian Amazon where 307 tree species (diam.>10 cm) were found in a single hectare of forest in the Cuyabeno Reserve (Valencia et al. 1994). Generally, the greatest number of species of canopy trees, understory trees and lianas are found between 0-500 m elev. in the Amazon region of the country (Table 10). Orchids are the most diverse plant group in the Amazon region (579 species) as they are in the whole country where 2,999 species have been recorded of which 43% are endemic.

**Table 10 Eight most diverse plant families in the Amazon region**

Most diverse families	Number of species
Orchidaceae	579
Rubiaceae	238
Melastomataceae	225
Piperaceae	151
Araceae	114
Bromeliaceae	104
Mimosaceae	104
Solanaceae	100

Source: Moller Jorgensen & León 1999

Of the seven vegetative zones in the Galapagos Islands five can be considered forest types.

Generally they are classified as: Arid, Transition, Scalesia, Zanthoxylum and Miconia. These forest types occur according to the amount of rainfall and rainfall in the Galapagos Islands is a function of elevation and exposure. The last four of the forest types occur only on the four islands where the mountains rise high enough to block winds and cause rainfall and only on the windward side of the islands.

### **Faunal Diversity**

Information about animal diversity in Ecuador is best known for groups such as mammals, birds and butterflies; amphibians, reptiles and fish are, for example, groups of vertebrates that need more study to reach true numbers of the species diversity found in the country (Table 11).

**Table 11 Number of Ecuadorian vertebrate species**

<b>Faunal group</b>	<b>Number of species in Ecuador</b>	<b>Number of species in the world</b>	<b>Percentage (%) found in Ecuador</b>
Mammals	369	4,629	8.0
Birds	1,616	9,040	17.9
Reptiles	394	6,458	6.0
Amphibians	415	4,222	9.8
Fish	1,340	18,910	7.1
Total	4,134	43,259	9.6

Source: MAE, EcoCiencia & UICN 2001

Of the 369 species of mammals known in Ecuador, 30 species (8.1%) are endemic. Mammal diversity is greatest in the lowlands on both sides of the Andes, particularly in the humid forests of the Amazon. Not surprisingly, rodents and bats are the mammalian orders with the highest degree of endemic species. In 2000, there were 33 threatened mammal species found in Ecuador, six of them being endemic (Table 12).

Ecuador is known worldwide for its avian diversity but its truly endemic are few. Diversity is highest in humid Amazonian forests (700 species), humid lowland Pacific forests (485), and low montane forests on both sides of the Andes (300-450); Galapagos has 100 bird species. Canaday (2000) considers only 14 bird species, of a total 1,616 species, to be endemic on continental Ecuador and 38 species to be endemic on the Galapagos.

The greatest diversity of reptile and amphibian species in Ecuador are found in the lowlands and diversity drops with an increase in altitude. About 30% of both amphibians and reptiles are found in the Amazon. It is estimated that about 77% of the amphibians found at high elevations are endemic species (Coloma & Quiguango 2000). It is also known that many frog species are extremely susceptible to environmental perturbations and some have disappeared from Ecuadorian landscapes in the last decade because of infection by a fungus (supported by extensive field data from Ecuador) or changes in climate or the atmosphere.

**Table 12 Status of some Ecuadorian mammals**

<b>Common name</b>	<b>Scientific name</b>	<b>Threat rating</b>	<b>Endemic</b>
Galapagos Rice Rat	<i>Oryzomys galapagoensis</i>	CR	yes
Spiny Rat species	<i>Makalata occasius</i>	CR	
Blue Whale	<i>Balaenoptera musculus</i>	EN	
Colombian Weasel	<i>Mustela felipei</i>	EN	
Ecuador Fish-eating Rat	<i>Aotomys leander</i>	EN	yes
Ecuadorian Sac-winged Bat	<i>Balantiopteryx infusca</i>	EN	yes
Fin Whale	<i>Balaenoptera physalus</i>	EN	
Giant Armadillo	<i>Priodontes maximus</i>	EN	
Giant Otter	<i>Pteronura brasiliensis</i>	EN	
Mountain Tapir	<i>Tapirus pinchaque</i>	EN	
Pacarana	<i>Dinomys branickii</i>	EN	
South American Spiny Mouse	<i>Scolomys melanops</i>	EN	yes

Common name	Scientific name	Threat rating	Endemic
Amazonian Manatee	<i>Trichechus inunguis</i>	VU	
Boto (Amazon River Dolphin)	<i>Inia geoffrensis</i>	VU	
Bush Dog	<i>Speothos venaticus</i>	VU	
Bushy-tailed Opossum	<i>Glironia venusta</i>	VU	
Central American Woolly Opossum	<i>Caluromys derbianus</i>	VU	
Equatorial Dog-faced Bat	<i>Molossops aequatorianus</i>	VU	yes
Fernandina Galapagos Mouse	<i>Nesoryzomys fernandinae</i>	VU	
Fraternal Fruit-eating Bat	<i>Artibeus fraterculus</i>	VU	
Galapagos Fur Seal	<i>Arctocephalus galapagoensis</i>	VU	yes
Giant Anteater	<i>Myrmecophaga tridactyla</i>	VU	
Goeldi's Marmoset	<i>Callimico goeldii</i>	VU	
Handley's Nectar Bat	<i>Choeroniscus periosus</i>	VU	
Harmless Serotine Bat	<i>Eptesicus innoxius</i>	VU	
Humpback Whale	<i>Megaptera novaeangliae</i>	VU	
Long-haired Spider Monkey	<i>Ateles belzebuth</i>	VU	
Lowland Woolly Monkey	<i>Lagothrix poeppigii</i>	VU	
Santiago Galapagos Mouse	<i>Nesoryzomys swarthi</i>	VU	
Smoky Bat	<i>Amorphochilus schnablii</i>	VU	
Spectacled Bear	<i>Tremarctus ornatus</i>	VU	
Western Nectar Bat	<i>Lonchophylla hesperia</i>	VU	

Source: IUCN threatened categories are: Critically Endangered (CR), Endangered (EN) or Vulnerable (VU). Source: IUCN Red List of Threatened Animals, 2004.

## Marine Biodiversity

Four hundred seventy-nine species of marine fish, including reef species, have been recorded for Ecuador (MAE, EcoCiencia & UICN 2001). Half of these species belong to the perch-like fish Order Perciformes, the largest Order of fish worldwide as well as the largest Order of vertebrates. Other groups include sharks (9% of Ecuadorian marine fish diversity), sardines and anchovies, rays, eels, catfish, flatfish, scorpion fish and flatheads, puffers, boxfishes and cowfishes.

The Ecuadorian coastline is 4,597 km long and over 60% of the country's inhabitants live within 100 km of the coast, based on 1995 population figures (Earthtrends 2003). This figure indicates the importance of coastal and marine ecosystems to the human population of Ecuador.

## Agricultural Biodiversity

The loss of forests and habitat destruction is causing a loss of agricultural species and varieties as well as traditional crops such as native potatoes, melloco, oca, mashua, chocho, and jícama. Studies by the National Autonomous Institute for Agricultural Research (INIAP) in the highland Provinces of Tungurahua, Chimborazo and Cañar suggest that there is a loss of traditional varieties between 12-40% (Estrella et al. 2005). The use of modern farming techniques are also threatening traditional practices that have been used for centuries by generations of Andean farmers. Even so, highland indigenous communities continue planting traditional crop varieties of diverse species such as corn, potatoes, sweet potato, melloco, oca and other high Andean crops for subsistence and sale in local markets.

Many local and international organizations in the Andean region are making an effort to conserve agricultural crop varieties. Local organizations include the Instituto Nacional Autónomo de Investigaciones Agropecuarias (INIA), Instituto Nacional Autónomo de Investigaciones Agropecuarias (INIAP), Promoción e Investigación de Productos Andinos (PROINPA). International centers include the Centro de Agricultura Tropical (CIAT) and the Centro Internacional

de la Papa (CIP). Strategies for “ex situ” biodiversity conservation include germplasm banks that are used in Andean countries in particular to protect a representative fraction of the regional and national agricultural biodiversity. It is estimated that about 90,000 samples of Andean tuber crops and others have been accessioned and stored in germplasm banks (Estrella et al 2005). The scientists and agronomists working in these germplasm banks are continually generating new plant varieties for food production security. The germplasm bank in Ecuador houses more than 37 million seeds for food security and to protect the patrimony of present and future generations.

## ACTIONS TO CONSERVE ECUADOR'S BIODIVERSITY AND TROPICAL FORESTS

### Selection of Priority Conservation Actions

The following are the four categories of threats to Ecuador's biodiversity and tropical forests:

**Conversion of natural habitat:** Natural habitat provides the conditions for the reproduction of species and sub-species of plants and animals. Conversion reduces the area of habitat available and therefore plant and animal populations. Deforestation is the most widespread example of conversion of habitat.

**Contamination:** Contamination affects biodiversity by directly killing plants and animals or by reducing their rates of growth and reproduction by changing their habitat, reducing their ability to compete with other organisms, or by reducing their rate of reproduction.

**Over-exploitation:** Over-exploitation affects biodiversity and tropical forests by reducing the numbers of certain species of plants or animals. Reduced populations may lead to reduced rates of reproduction of the over-exploited species. It may also affect the genetic characteristics of the species. If only the best phenotypes of commercial timber trees are removed from the forest, for example, the genetic characteristics of the species may be degraded.

**Introduced species:** Introduced species affect biodiversity by competing with native species of plants and animals, affecting the reproduction rates and genetic diversity of native species.

Five types of actions are required to reduce these threats.

**Policy Actions:** Policy actions improve the effect of policies, laws, and regulations on the conservation of biodiversity and tropical forests.

**Institutional Actions:** Institutional actions improve institutional capabilities for conservation of biodiversity and tropical forests.

**Research Actions:** Research actions improve the base of knowledge for making decisions about the design and implementation of conservation actions.

**Environmental Communication Actions:** Environmental communication actions build public and political support for conservation.

**Management Actions:** Management actions involve doing things in the field such as actually carrying out forest management, protected areas, or productive activities.

The assessment team, based on its focus group discussion with Ecuadorian experts, review of reports, interviews, and prior experience, identified the principal conservation actions that are needed to reduce the four threats to Ecuador's biodiversity and tropical forests. Priority actions for USAID/Ecuador financing during 2007 to 2012 were identified by comparing the needed actions against the following seven selection criteria:

**Feasibility:** It must be feasible for the action to achieve significant results with the funds made available to USAID/Ecuador from 2007 to 2012. If the action was judged unfeasible, the action was eliminated from further consideration.

**Area:** Actions that conserve larger areas are preferable to ones that achieve conservation on smaller areas.

**Biodiversity:** Actions to conserve areas of high biodiversity are preferable to ones that conserve areas of lesser biodiversity.

**Sustainability:** Actions that are more sustainable are preferable to ones that are less sustainable.

**Experience:** Actions based on successful USAID/Ecuador experiences or lessons learned are preferable to ones for which there is little or no USAID/Ecuador experience.

**Synergy:** Actions that permit synergy with other actions are preferable to ones that do not permit synergy with other actions.

**Gaps:** Actions that are required but have not been financed by other institutions are preferable to actions that other institutions are involved in and financing.

Table 13 indicates the ratings that were given to each of the needed conservation actions.

**Table 13 Analysis of Needed Conservation Actions**

Categories of Threats/ Needed Conservation Actions	Type of Action	Feasible	Large Area	High Bio- diversity	Sustainable	Previous USAID Experience	Syner- gies	Gap	Number Criteria Met
Conversion of Habitat									
(1) Resolve legal contradictions	Policy & Legal	no	-	-	-	-	-	-	-
(2) Consolidate indigenous territories	Policy & Legal	yes	yes	yes	yes	yes	yes	yes	7
(3) Strengthen indigenous organizations	Institutional	yes	yes	yes	no	yes	yes	yes	6
(4) Strengthen SNAP financing	Institutional	yes	yes	yes	yes	yes	yes	yes	7
(5) Establish regular SNAP training	Institutional	yes	yes	yes	yes	yes	yes	yes	7
(6) Establish a forest monitoring system	Research	yes	yes	yes	no	yes	yes	yes	6
(7) Communicate biodiversity values	Communication	yes	yes	yes	yes	yes	yes	yes	7
(8) Increase highland agriculture productivity	Management	no	-	-	-	-	-	-	-
Over-exploitation									
(9) Promote technical forest management	Management	yes	yes	yes	yes	yes	yes	yes	7
(10) Promote silviculture research	Research	yes	yes	yes	yes	no	yes	yes	6
(11) Revise & enforce forestry law	Policy & Legal	no	-	-	-	-	-	-	-
(12) Enforce marine zoning & fishing quotas	Policy & Legal	yes	yes	no	no	yes	no	no	3
(13) Enforce CITES	Policy & Legal	yes	no	yes	no	no	yes	no	3
(14) Research key faunal species	Research	yes	yes	yes	yes	yes	yes	yes	7
(15) Apply Galapagos lessons to SNAP	Institutional	yes	yes	yes	yes	yes	yes	yes	7
(16) Promote alternative economic activities	Management	yes	no	no	no	yes	no	no	2
Introduced Species									
(17) Revise Galapagos tourism policy	Policy & Legal	no	-	-	-	-	-	-	-
(18) Research introduced species on Galapagos	Research	yes	no	no	no	yes	no	no	2
(19) Prevent & control introduced species	Institutional	no	-	-	-	-	-	-	-
Contamination									
(20) Establish municipal contamination	Policy & Legal	yes	no	no	no	no	no	no	1

policies									
(21) Strengthen municipal waste capabilities	Management	no	-	-	-	-	-	-	-
(22) Research effects of contamination	Research	yes	no	no	no	no	no	no	1
(23) Control & reduce industrial contamination	Policy & Legal	yes	no	no	yes	yes	no	no	3
(24) Control & reduce pesticide use	Institutional	yes	no	no	no	yes	no	no	2
(25) Reduce mining & oil contamination	Policy & Legal	no	-	-	-	-	-	-	-



## **Conversion of Natural Habitat**

### **Description of the Threat**

Conversion of natural habitats threatens Ecuador's biodiversity by eliminating the conditions required for the reproduction of certain animals and plants, and threatens tropical forests by replacing it with other land uses.

Change of land use from forest to agriculture and pasture is the chief cause of conversion of natural habitat in Ecuador. Ecuador's biodiversity is concentrated in its forestlands. The conversion of forest to another use thus devastates so the biodiversity on that piece of land. If enough forestland is converted to other uses, then the overall level of biodiversity, at the genetic, species, and ecosystem levels, is reduced. Based on a comparison of satellite images, CLIRSEN (2003) estimated that between 1991 and 2000 the deforestation rate in Ecuador was 198,000 hectares per year and that the area of forest decreased from 13,462,654 hectares to 11,679,822 hectares. The most area of deforestation occurred in the Amazon Region but the fastest rate of deforestation was in the Coastal Region. The remaining forest fragments in the Highland Region also continued to be converted to agriculture and pasture.

The CLIRSEN study analyzes only four broad and arbitrarily chosen forest types and does not indicate where the deforestation is taking place. It does not, for example, indicate how much deforestation is taking place within the SNAP or indigenous territories. Moreover, the study is now over six years old. Forest policy decisions should draw on up-to-date, detailed data. Without data on the location and extent of habitat elimination within protected areas, it is difficult to plan effective actions to counter this threat to biodiversity and tropical forests.

The expansion of agriculture into highland grasslands occurs as farmland at lower elevations loses its productivity and farmers seek fertile agricultural land in the communal grasslands at higher elevations and as demand for agricultural products increases, because of growing populations and larger or new markets. The biodiversity of many highland grasslands has already been affected by grazing, soil compaction, and fire. Nonetheless, there remain large areas of natural paramo that are threatened by the expansion of agriculture and grazing at higher elevations.

The expansion of urban areas also is eliminating natural habitat in Ecuador. Urban growth, however, affects only relatively small areas around existing cities and towns where natural habitat and its biodiversity have already been degraded. Urban expansion, however, may significantly affect certain species of animals, for example, the expansion of Guayaquil has eliminated large areas of the mangrove and dry forest, reducing the area of habitat for the Guayaquil parrot. Likewise, Quito's expansion has decreased the habitat for the populations of the hummingbirds that live on the Pichincha Volcano.

### **Past Actions**

#### **USAID**

From 1982 to 1991 the Forestry Sector Development Project reduced the threat of agriculture and pasture expansion through the field promotion of agroforestry practices, the delimitation of the national forestlands (*Patrimonio Forestal*), and the preparation management plans for protected areas, including the protective forest on the Pichincha Volcano. Between 1983 and 1993, USAID/Ecuador financed the Nature Foundation (Fundación Natura) to carry out the EDUNAT I, II, and III environmental communication projects, which made more Ecuadorians aware of the effects of deforestation. In the 1980's, USAID financed CARE to promote soil conservation with the aim of reducing the rate of conversion of highland grasslands to agriculture. During the late 1980's and early 1990's USAID financed the Coastal Resources Management Project (CRMP) one of whose objectives was to reduce the rate of conversion of mangrove forest areas to shrimp ponds. In the 1990's the Agricultural Sector Policy Project financed policy studies that elucidated the

relationships between rural development policies and the rate of deforestation. Between 1991 and 2001, the Sustainable Uses for Biological Resources Project (SUBIR) worked to reduce the rate of deforestation in the buffer zones of the Cayambe-Coca, Cotacachi-Cayapas, and Yasuni protected areas through land use planning, forest management, land titling, agroforestry, and institutional development. SUBIR also prepared land use plans covering 65,600 ha in Esmeraldas Province and a natural resource management plan for the Huaorani Ethnic Territory Reserve covering 809,339 hectares. USAID financed protection of the Cayambe-Coca and Antisana protected areas under the Parks-in-Peril (PiP) Program and under SUBIR financed the establishment of the Water Fund (FONAG) under which Quito water users pay for protection of part of the Cayambe-Coca Ecological Reserve.

### **Other Institutions**

In the 1970's, with technical advice from the Food and Agriculture Organization (FAO), Ecuador created through decree many large protected areas that are now part of the SNAP. Since then, the Ecuadorian government and various international agencies have financed park guards, infrastructure, and operating expenses for the SNAP. During the 1990's the German government financed the establishment of the Gran Sumaco Biosphere Reserve, and the Global Environmental Facility (GEF) financed a project that strengthened various aspects of the SNAP.

Since the late 1980's, the German technical assistance agency, GTZ, has financed three different forest management and policy projects in Ecuador. In the 1990's the British government financed a forest management and sawmilling project in Esmeraldas Province. During the 1990's and early 2000's the Durini Foundation, financed by the Durini wood industry group attempted for more than 10 years, although eventually unsuccessfully, to establish forest management agreements with the Chachi indigenous groups in Esmeraldas Province. Many Ecuadorian and international projects have financed activities to increase agricultural productivity in the Highland Region and thus reduce the spread of agriculture into the highland grasslands.

### **Current Actions**

#### **Actions Financed by USAID**

Since 2001, USAID has financed the CAIMAN Project to work within various indigenous territories to strengthen their institutions, legalize their titles, and establish new sources of income from forest products. The Parks in Peril Program with The Nature Conservancy and its local partners (Fundacion Antisana, Fundacion Rumicocha, EcoCiencia, and the Quito Water Fund (FONAG) supports the management of public protected areas, municipal, and private lands in the central Andes. USAID also supports effective environmental communication through an agreement with the OIKOS Corporation. The Southern Border Program (PSUR) has financed the titling of nearly 200,000 hectares of indigenous lands in Morona-Santiago Province and the preparation of forest management plans for private forestlands.

#### **Actions Financed by Other Institutions**

Many other private, public, national, and international institutions are financing activities in Ecuador with the objective of reducing the conversion of natural habitat to other uses. The NGO Jatun Sacha, for example, is managing ten private reserves, protecting them from deforestation. Several other NGOs also are protecting forests in private reserves. The Coastal Resources Management Project, financed by the Inter-American Development Bank (IDB) continues to work to protect mangrove forests. CLIRSEN is beginning a study of changes in vegetation in the Galapagos Islands. The Pinchot Institute is financing a forest management and sawmill project in Northwest Ecuador. This is only a partial list of the many activities being implemented in Ecuador to reduce loss of natural habitat.

### **Needed Actions**

#### **1) *Resolve legal contradictions***

Ecuadorian laws, regulations, and international agreements related to indigenous territories, national protected areas, and natural resource extraction contain many contradictions. Articles 83 and 84 of the 1998 Constitution, for example, recognize the right of indigenous peoples to administer their traditional territories. Yet, based on the 1981 Law of Forestry, Protected Areas, and Wildlife, and on the 1997 Law of Agricultural Development, the Ecuadorian government claims jurisdiction over the parts of indigenous territories that lie within national protected areas and the national forest patrimony (*Patrimonio Forestal*). Likewise, under the 1989 Convention 169 of the International Labor Organization, to which Ecuador is signatory, indigenous peoples have the right to administer their own territories. Yet the Ministry of Energy and Mines continues to adjudicate petroleum and mining concessions within indigenous territories without consultation with indigenous peoples. Similarly, the Ministry of Energy and Mines adjudicates mining and oil concessions within national protected areas and the government claims the right to regulate management of all forests, even on legally titled private or communal land. These policy, legal and regulatory contradictions greatly complicate efforts to protect Ecuador's biodiversity and tropical forest.

This action was judged unfeasible because USAID/Ecuador lacks the funds and time to achieve a change in the laws and regulations that would be required to resolve such complicated legal and regulatory contradictions.

## **2) Consolidate indigenous territories**

Articles 83 and 84 of Ecuador's 1998 Constitution and the International Labor Organization Convention 169 guarantee indigenous people legal title to their traditional lands, most of which are covered by highly biological diverse forest. In Ecuador, indigenous people claim over four million hectares of traditional land. They have received legal title, however, to less than two million hectares. Since Ecuador has not prepared or adopted a regulation to implement the provisions for titling large, indigenous territories, titling of indigenous land continues to be an expensive, time-consuming, complicated process. If land titling of the 1.2 million hectares of traditional Shuar lands in Moron-Santiago Province continues at its present pace, for example, it will take twenty years to complete. Yet protecting forestland from conversion to agriculture and pasture requires secure land tenure and boundaries. Action in support of titling traditional indigenous territories is thus essential for conserving their biological diversity and forests.

This action met all seven of the criteria. Previous USAID/Ecuador projects over ten years, including SUBIR, CAIMAN, and PSUR, have shown the feasibility of land titling of indigenous territories. The Amazonian indigenous groups, such as the Shuar, Achuar, Huaorani and Quichua, have legitimate traditional claims over large land areas, most of them covered with almost continuous biologically-diverse forest. Land titles will increase the sustainability of conservation actions in the indigenous territories. Land titling creates many synergies between conservation actions, such as institutional strengthening, research, and economic opportunities, and will be synergetic with the Amazon Basin Conservation Initiative (ABCI).

## **3) Strengthen indigenous organizations**

At least four factors make the development of effective national, regional, and local indigenous organizations difficult. First, the difficulties of obtaining land titles stimulate conflicts between indigenous groups. The Shuar, for example, have three organizations, each espousing a different method of land titling. Second, it can be advantageous for national and local government, oil and mining companies, religious groups and perhaps some NGOs, to keep indigenous organizations divided and therefore weak, so that they can more easily be influence and manipulated. Third, indigenous peoples focus on helping their families rather than on building organizations; consequently, family interests frequently supersede those of indigenous organizations. Fourth, indigenous leaders of these organizations are often accused of failing to adequately represent their constituency. Weak organizations make it difficult for indigenous people to take effective actions to conserve biodiversity and tropical forests. Actions to strengthen indigenous organizations that have rights over the use of large, biologically diverse territories, usually heavily forested will contribute, therefore, to biodiversity and tropical forest conservation.

Action (3) meets six criteria. Indigenous organizations are influential in what land use and extraction activities occur on their large, biologically diverse traditional areas. USAID, through the SUBIR and CAIMAN projects, has accumulated experience in strengthening indigenous organizations. Strengthened indigenous organizations will interact more effectively with other institutions and thus create possibilities for synergies between research and productive activities. Although many donors are financing various projects with indigenous organizations, a funding gap remains for strengthening indigenous organizations in Ecuador. This action may not be sustainable, however, as indigenous organizations are notoriously unstable.

#### **4) Strengthen SNAP financing**

In 2003, the continental SNAP received a total budget of US\$2.7 million from all sources excluding the Galapagos National Park which receives more governmental and donor funding than the entire continental components of the SNAP. The minimum budget required to cover the operating costs of the SNAP is estimated to be US\$6.3 million and the amount needed to make the management fully effective is US\$12.2 million (Ministry of Environment, 2005). Consequently, the SNAP requires at least US\$3.3 million more and preferably US\$9.3 million more than it received in 2003.

There are two key actions needed to address this gap in funding and capability. The first action is to ensure that the Government of Ecuador maintains its direct investments in protected areas. Second, the Ministry of Environment must continue to implement the financial and structural reforms now being supported by Global Environment Facility.

Contributions to the National Environmental Fund (FAN), increased self-financing of individual protected areas through access charges, and the payment for environmental services such as the provision of water (following the example of Quito's Fund for Water [FONAG]) are three ways to increase the SNAP's degree of adequate, permanent financing.

Action (4) meets all seven criteria. FONAG and the Fund for Nature have demonstrated the feasibility of increasing financing for the SNAP. The action would support the conservation in all of the SNAP, which includes more than 5 million hectares with varied ecosystems and high levels of biodiversity and endemism. The SNAP is a legal entity and unlikely to disappear and successful mechanisms to finance it have a good chance of becoming permanent. USAID/Ecuador was a key player in the establishment of FONAG and this successful conservation funding mechanism could be replicated in other Ecuadorian cities and their water sources, often located in protected areas. Increased financing for the SNAP will enable many productive and synergetic interactions at the national and local level with other institutions and local people.

#### **5) Establish regular SNAP training**

SNAP staff require regular training to update the technical and administrative skills they need to adequately protect and manage the biodiversity and tropical forests in protected areas. Yet, in spite of the many training projects for the SNAP staff that international projects have financed, few SNAP staff have received the specific training they require to carry out adequately their job responsibilities. Actions to establish a system for providing regular training to SNAP staff would therefore contribute to the protection of Ecuador's biodiversity and tropical forests.

Action (5) meets the seven criteria. A well-trained SNAP staff will make good management decisions and will improve the conservation of biodiversity and forests. Although the SNAP staff may change, training will be sustainable because the staff will most likely continue to work in conservation. Well-trained professionals will look for synergistic opportunities and USAID/Ecuador has financed numerous training programs. Neither the Ministry of Environment nor other donors are financing training for SNAP staff.

#### **6) Establish a forest monitoring system**

Action (6) would establish a permanent forest monitoring system for the SNAP and indigenous territories. The monitoring would provide essential data for forest management, such as the

location of commercial and non-commercial forest areas, and for protected area management, such as the location of invasions and deforestation within protected areas. In order to be useful, forest monitoring must be systematic and regular.

This action meets six of the criteria. Monitoring is feasible, particularly with the digital imaging hardware and software that has recently become available. The action will affect the large forested areas of high biodiversity that are included in indigenous territories and SNAP. Such a system would be synergistic with other conservation actions, such as territorial consolidation and forest management. USAID/Ecuador has financed monitoring systems, such as those established by Jatun Sacha and EcoCiencia. Sound deforestation and land change data will be essential for the implementation of the ABCI. Although some other donors may be financing forest monitoring, there is still a large gap between the funds required and the funds needed for this action. Although the establishment of a permanent system for indigenous areas and SNAP runs the risk of being unsustainable without outside financing and technical supervision, the information that it would provide during the period 2007 to 2012 would greatly facilitate the implementation of USAID/Ecuador conservation actions.

### **7) Communicate biodiversity values**

Since relatively few Ecuadorians feel proud of and value the SNAP, it garners little public support. Widespread public understanding for the SNAP would strengthen its political support and its capability to conserve biodiversity and tropical forests. An effective national program to communicate the characteristics and values of the SNAP to all Ecuadorians would yield large benefits for the conservation of Ecuador's tropical forests and biodiversity.

Action (7) meets the seven criteria. The program will affect large areas with high biodiversity. Effective public communication programs are sustainable as they influence decision-makers over long periods. USAID/Ecuador has had successful experience in environmental communication programs with EDUNAT I, II, and III projects and the GREENCOM project during the 1980's and 1990's, based on the understanding that environmental messages need to address the specific constraints that keep people from adopting more environmentally friendly practices. Environmental communication programs create many synergies with other conservation actions and are likely to be an important part of the ABCI. Education programs have been carried out many times and so are feasible.

### **8) Increase agricultural productivity**

The main cause of elimination of highland grassland is its conversion from communal grazing use to private agricultural use. One reason for such conversion is the low agricultural productivity on private lands at elevations below the *paramo*. Low productivity may not permit agricultural production to meet family or market demand for agricultural products, leading farmers to increase their production by expanding agricultural production into the *paramo*. Improving agricultural productivity through appropriate technology and soil conservation is likely to decrease the expansion of grazing lands to natural highland areas.

In forested areas, increased agricultural productivity only leads to conservation under specific conditions. These conditions include labor intensive agricultural improvements that result in high production on a small plot, and that farmers are fully occupied in that activity so that they have no time to engage in complimentary agricultural activities. It would be necessary to evaluate if these conditions exist in Ecuador prior to financing activities to improve agricultural productivity with the objective of reducing the rate of conversion of forestland to other uses.

Action (8) was not considered feasible. Agricultural productivity improvements are likely to require more time and funds than USAID/Ecuador will have available.

## Overexploitation

### Description of the Threat

Over-exploitation affects biodiversity and tropical forests by reducing the populations of species or subspecies of plants and animals. Over-fishing is reducing the populations of marine organisms who live off the Ecuadorian coast and the Galapagos Islands, such as lobsters, shellfish, and sharks. For example, more than four million sea cucumbers, used as medicine in China, were exported from Ecuador between 1992-1999 (TRAFFIC 1999). On the mainland, hunting for food is reducing the populations of wildlife species. Valuable timber trees are being exploited without ensuring their adequate regeneration. Illegal commerce is also severely affecting many species of plants and animals (Table 14). International transport routes for these organisms include land, air and sea, in personal luggage, shipped packages and diplomatic pouches (Buitrón, 2005).

**Table 14 Illegally captured and traded Ecuadorian plants and animals**

Category	Examples
Trees	Chanul ( <i>Humiriastrum procerum</i> ), ahuano ( <i>Swietenia macrophylla</i> ), cedro ( <i>Cedrela odorata</i> ), olivo ( <i>Podocarpus</i> spp.)
Medicines	Cinchona, sangre de drago, uña de gato, cola de caballo, turtles and boas
Foods	Marine fish species (bacalao, blue-fin tuna, sharks)
Ornaments	Corals, turtle and conch shells, and mounted insects such as beetles and butterflies; and plants, especially orchids, cacti, bromeliads, ferns, heliconias, aroids; timber and non-timber forest products for construction, furniture, and musical instruments
Skins	Many mammalian, reptilian (e.g. caiman) and fish species
Pets	Parrots, macaws, owls, ducks and pigeons, hawks and falcons; terrestrial fauna such as turtles, monkeys, pacas, armadillos, spectacled bears coatis and anteaters.
Aquatic Animals	Sea cucumbers, sharks, seahorses, turtles and fish

Sources: Buitrón, X. 2005; Vigilancia Verde 2005

### Past Actions

#### USAID

During the 1980's and 1990's USAID/Ecuador financed the Coastal Resources Management Project (CRMP), the Sustainable Uses for Biological Resources Project (SUBIR), and the Galapagos Marine Reserve Projects. During the 2000's it financed the CAIMAN Project, and part of the Vigilancia Verde activity. These activities all included efforts to establish control over the over exploitation of timber, wildlife, and aquatic species. During the 1980's, under the Forestry Sector Development Project, USAID/Ecuador financed botanical and ethnobotanical studies in the Amazon Region and forest management with indigenous groups along the Hollin-Loreto road. Under the SUBIR, CAIMAN, and Galapagos Marine Reserve Projects, USAID/Ecuador has continued to finance the collection of baseline data regarding biological resources of tropical forests and the marine life of the Galapagos Marine Reserve.

#### Other Institutions

A number of institutions have contributed financing for Vigilancia Verde, which attempted to control the exploitation of plants and animals of commercial value. The international NGO TRAFFIC has been active in Ecuador in identifying trade over-exploited species of plants and animals.

### Current Actions

#### USAID

The CAIMAN project, supported for three years by USAID/Ecuador, is involved in forest protection and logging control by local people, though the specific patrolling activity that pays opportunity costs to local stakeholders to keep their forest standing is financed by the GTX (see below). PSUR

has prepared many forest management plans with the objective of providing legal sources of wood. USAID/Ecuador also finances the strengthening of the Management Board of the Galapagos National Marine Park, the environmental capabilities of selected municipal governments, and the financing of community park guards in several continental national protected areas.

### **Other Institutions**

The CAIMAN Project, with assistance from CI and GTZ, includes a component where local people are being paid to protect their forested land that otherwise would likely have been logged out or converted to farm or pastureland (J. Quieroz, pers. comm.). Specifically, Chachi “park guards” are being paid to protect their self-proclaimed 7,000 ha conservation area belonging to three Chachi communities, within their 30,000 ha territory. Based on the results of a CI-financed study on opportunity costs of not logging, the GTZ is paying Chachi guards the equivalent of \$5/ha/yr to keep the forest standing. This project is now in its second year and is working; the Chachi communities now have drinking water and money is being spent on community education and health. The principal problem that has arisen is one to do with community organization relating to exactly where this money should go and how these funds should be spent. CI is presently seeking funds from GEF to add to donated seed money for the creation of a trust fund that would continue to pay Chachi park guards when GTZ leaves the project.

The Ministry of the Environment has recently (02/06) convened two groups to deal with the country’s emergency issues surrounding logging controls: (1) a group made up of 15 people (the majority from the logging sector) to disseminate information and discuss this issue at a regional level, and (2) a team made up of an economist, lawyer, and a forester, to prepare a document that will serve as a baseline for a discussion on actions needed for forest management and logging. It is unclear whether either of these two forums will address the participation of the Swiss verification company SGS as a potential actor in logging control. The Ministry of the Environment’s forestry agenda also includes the National Plan for Reforestation (Plan Nacional de Forestación) and the decentralization of all forestry related issues.

### **Needed Actions**

#### **9) Promote forest management**

Ecuador’s high rates of deforestation indicate that forest management is not generally considered a financially competitive land use compared to agriculture and grazing. For forestry to become competitive, landowners must apply forest management practices that maintain or improve forest productivity and quality and produce an income for the forestland owner. Actions to provide forestland owners with technical forestry advice would thus benefit the conservation of tropical forests and biodiversity.

Forest management contracts between indigenous landowners and forest product companies may be a way to increase local income by offering a solution to the problem of low prices for wood and other forest products resulting from illegal extraction. Legitimate long-term agreements and contracts between indigenous forestland owners and forest product companies may help to legalize and formalize the exploitation of wood and non-wood forest products. Another way to increase income of indigenous peoples would be replicate successful projects that result in payment of fees for patrolling and preserving remaining large tracts of intact forest. The Secoya in Sucumbíos are converting their forestland to pasture in their desperation for income; this may be an appropriate site to replicate the Chachi experience.

Action (9) meets all seven criteria. Forest management focused on indigenous territories usually includes the conservation of large, biologically diverse tracts of forest. The Awa territory, for example, includes almost 100,000 hectares and the Shuar territories encompass over a million hectares. Forest management in indigenous territories would help conserve the biodiversity of large areas. Successful forest management is a long-term, sustainable activity. USAID/Ecuador has almost 20 years of experience in designing and administering forest management projects,

including the Forestry Sector Development Project, SUBIR, CAIMAN, and PSUR. When forest management actions take place on indigenous territories, there will be numerous synergies between this action and other priority actions. Although other donors are financing forest management there is still a gap in the funding for this type of activity.

#### **10) Promote silviculture research**

Applied research on the distribution, ecology and silviculture of tropical trees forms the basis for forest management. Although there is now ecological information about some commercially valuable tree species, in Ecuador much remains to learn about the silvics and silviculture of many other potentially valuable tree species. The application of basic knowledge to forest management and conservation problems is often missing. Scientists and foresters working in Ecuador should be encouraged to direct their efforts to make this connection between research and conservation.

This action met six criteria. Silviculture research is feasible and sustainable, especially if local universities are involved; it would positively affect large forested areas with high biodiversity. Applied research would be synergistic with forest management. Few donor institutions are financing silviculture research in Ecuador. USAID/Ecuador does not have much experience in financing silviculture research.

#### **11) Revise and enforce the Forestry Law**

The Ecuadorian state claims ownership over all forest resources, even if they occur on private land. The Ministry of the Environment has promulgated regulations for the logging on private land. These regulations are surprisingly specific, considering the variability of forest conditions in different regions of Ecuador, the relatively little scientific basis for establishing silviculture requirements for the regeneration of commercial tree species, and the incapacity of the Ministry of Environment to monitor or enforce compliance. Compliance is costly to the forestland owner and there is little incentive to comply. After two years of little control over logging in Ecuador, it is unlikely that the Ecuadorian government will soon develop the capacity to enforce its own logging regulations. It would be more practical, therefore, to simplify the logging regulations to encourage voluntary compliance rather than continue futile attempts at their enforcement. Logging regulations would be more effective if they focused on reducing soil compaction from heavy machinery, ensuring natural regeneration of commercial species, and raising the productivity of forests to make them a more competitive land use.

For decades severance and transport fees levied on the cutting and transport of timber have distorted the activities of the Ecuadorian forestry institutions, from the National Forestry Directorate (DINAF) in the 1980's, to the National Institute for Forestry, Protected Areas and Wildlife (INEFAN) in the 1990's, to the Ministry of Environment in the 2000's. Rather than focus their limited resources on encouraging private forestland owners to conserve and manage their forests, most of the resources of these government agencies have been devoted to collecting severance and transport fees. In 1997, the Institute of Forestry, Protected Areas, and Wildlife (INEFAN) was even eliminated, so that the new Ministry of Environment could obtain control over the income from logging severance and transport fees, with the curious result that logging of tropical trees is a main source of funds for the operations of the Ministry of Environment. It is unlikely that it will be possible to create a strong Ecuadorian forestry agency, capable of effectively promoting the conservation of tropical forests and the biodiversity that they contain, unless its focus shifts from collecting severance and transport fees to encouraging landowners to manage and conserve their forests.

This action was not judged feasible with the time and funds available to USAID/Ecuador during the period from 2007 to 2012. There are too many political variables involved to permit the revision or enforcement of the forestry law.

#### **12) Enforce marine zoning and fishing quotas**

Fishing quotas cannot be established nor enforced without zoning the aquatic resources. Zoning is



particularly important in multi-use areas surrounding parks and other protected areas such as the Galapagos Marine Reserve. Zoning should be done based on the knowledge and participation of local fisherman as they are ones who know most about the resource and will enforce the zoning and regulations.

This action meets three of the seven criteria. If applied in the Galapagos Marine Reserve, the action would affect a large area, although its biological diversity is not extraordinary. Given the instability in the Galapagos, however, the action will be difficult to implement and is unlikely to be sustainable. USAID does have previous experience in financing activities in the Galapagos Marine Reserve the application of these experiences to coastal areas would be synergistic. Other donors are involved in zoning and enforcement of quotas in the Galapagos.

### **13) Enforce CITES**

The proliferation of illegal logging and international trade of animal and plant species from Ecuador requires the enforcement of the International Convention on Trade in Endangered Species (CITES).

This action was judged to be unfeasible because USAID/Ecuador does not have the funds or time to produce significant results between 2007 and 2012 regarding the enforcement of CITES.

### **14) Research key faunal species**

The actual demographic status of most Ecuadorian animal species remains largely unknown. Yet some animal species play key roles in forest ecology and regeneration. Some species of mammals, for example, play key roles in ensuring the regeneration of certain species of trees. If these species do not occur in sufficient numbers, it may be difficult to achieve regeneration. Research on endangered fauna, therefore, is important for regenerating the forest after harvesting of wood occurs.

This action was rated as meeting all seven of the criteria. It would be feasible for USAID/Ecuador to finance research that would produce significant results for some of the key animals that play an important role in the regeneration of commercially important tree species. Research that enhances forest management would affect large areas of biologically diverse forest and long-term management would make the benefits of research sustainable. There are many synergies between research and other conservation actions and there is a gap in funding research on endangered fauna.

### **15) Apply Galapagos lessons to coastal SNAP**

The Ecuadorian government, USAID/Ecuador and a number of other donors have financed many types of conservation efforts in the Galapagos for a long time. There should be valuable lessons learned from these conservation actions that could be replicated and applied to conservation in the rest of the SNAP and particularly to the coastal components of the SNAP.

Action (15) meets the seven criteria. This is a feasible action that will benefit large, biologically diverse protected areas along the coast, such as the Churute Mangrove Reserve and the Machalilla National Park. Successful lessons are those most likely to be sustainable and feasible. The action will create synergies between the Galapagos National Park and Marine Reserve and the coastal protected areas. No other donor is financing an action to identify lessons learned in the Galapagos that are applicable to the continental SNAP in general and the coastal components of the SNAP in particular.

### **16) Promote alternative economic activities**

Alternative economic activities for forest-dwelling families may reduce over exploitation pressure on forest resources. Economic options for indigenous families many are limited, however, because their societies have relatively few links to markets. Lack of infrastructure and cultural differences create problems for successful entry into outside markets. Furthermore, a recent study by the

Wildlife Conservation Society (WCS) found that income generation led to a decline in the standard of living of six Quichua communities in Yasuní National Park (J. Quieroz, pers. comm.). Their income increased with the sale of game meat but this income was used by indigenous families to buy rice and noodles, a change in their diet that resulted in malnourishment.

Action (16) meets only two of the seven criteria. It is feasible to promote successful alternative economic activities and USAID/Ecuador has experience in doing so. Yet actions to promote alternative economic activities are unlikely to affect large areas or affect a lot of biodiversity. These projects tend to use only small areas of land and to concentrate on the utilization of a few species. There is little evidence that they reduce the patterns of over exploitation or habitat change. They frequently have been unsustainable when economic conditions or markets change. When the alternative economic activity involves the commercialization of a forest product there are few synergies with other conservation activities. Many donors fund alternative economic activities.

## Introduction of Exotic Species

### Description of Threat

Some species of introduced plants and animals threaten biodiversity by affecting the successful reproduction of native populations of plants and animals.

There are many introduced species of plants and animals in Ecuador. Introduced animals include cattle, horses, cats, pigs and chickens, and trout. Introduced plants include eucalyptus, bananas, pineapple, pine, and wheat. New plants and animals continue to be introduced to mainland Ecuador sometimes purposefully, when the plants or animals may have commercial value, such as African oil palm, or sometimes inadvertently, as for bacteria and viruses, some of which can cause severe economic and health effects. These plants and animals have affected the diversity of native plants and animals.

The most serious introductions of non-native species are occurring on the Galapagos Islands. Because the Galapagos Islands were almost completely isolated from human contact until a little over 500 years ago, their vegetation and animals evolved in isolation. Therefore, they are not only a unique assemblage of plants and animals of great scientific value but extremely vulnerable to the competition of introduced species of plants and animals. Since the late 1960's, when tourists began to visit the Galapagos Islands in great numbers, the pace of introductions of new species of plants and animals has increased. More than 110,000 tourists visited the Galapagos Islands in 2005 and the permanent population of the islands has surpassed 20,000 (El Comercio, 01/06). Both tourists and permanent residents require imported food and materials. The increase in the rate of importations of goods has increased the risk of invasion by additional exotic plants and animals. Table 15 indicates the principal introduced plant species on the Galapagos Islands that threaten native vegetation.

**Table 15 Introduced plant species in Galapagos Islands**

Species	Common name	Islands			
		Sta. Cruz	Isabela	Floreana	San Cristobal
<i>Psidium guajava</i>	Guayaba	X	X	X	X
<i>Chinchona succirubra</i>	Cascarilla	X			
<i>Rubus niveus</i>	Mora	X			X
<i>Lantana camara</i>	Supirrosa	X		X	X
<i>Pennisetum purpureum</i>	Pasto elefante	X			X
<i>Kalanchoe pinnata</i>	Hoja de aire		X	X	X
<i>Eugenia jambos</i>	Poma rosa				X
<i>Pennisetum clandestinum</i>	Pasto elefante		X	X	
<i>Ricinus comunis</i>	Ricino	X	X	X	X
<i>Porophyllum ruderale</i>		X			

Species	Common name	Islands			
		Sta. Cruz	Isabela	Floreana	San Cristobal
<i>Momordica charantia</i>		X			

Source: Jaramillo 1999

### **Past Actions**

During the 1990's USAID financed the Darwin Station to make the initial studies and organize the first meetings which resulted in the establishment of the Galapagos Quarantine System (SIGAL). USAID also financed the Darwin Station to study the introduction, spread, and control of exotic species of plants and animals and to carry out public education programs.

### **Other Institutions**

Over the last several decades various international institutions have financed the Darwin Station and the Galapagos National Park to implement programs to control exotic plants and animals in the Galapagos Islands.

### **Current Actions**

#### **USAID**

So far as could be determined, USAID is not presently financing any programs to control exotic species in the Galapagos Islands.

#### **Other Institutions**

Beginning in the late 1990's the Inter-American Development Bank (IDB), the Global Environmental Facility (GEF), and the United Nations Development Program (UNDP) financed the reduction of populations of introduced animals, especially goats, on the Galapagos Islands. UNDP, GEF, IDB have financed projects to reduce the populations of introduced animals and plants.

The Introduced Plants Program of the Charles Darwin Foundation studies introduced plants, including their distribution and effects on native biodiversity and the environment. This includes research on potential biocontrol agents to control the widespread invasive species *Lantana camara* (supirrosa).

### **Needed Actions**

#### **17) *Revise Galapagos tourism policy.***

The Ecuadorian government continues to promote the continuous expansion of tourism to the Galapagos Islands. No limits have been enforced on the number of tourists allowed to visit the islands and the number of airplanes carrying tourists to the islands has responded without control to increased demand. Increased tourism, in turn, has driven the expansion of the permanent population on the Galapagos Islands, making necessary increased shipments of food and supplies and resulting in the inadvertent introduction of more exotic species of plants and animals. Moreover, the Ecuadorian government subsidizes the cost of energy in and air transport to the Galapagos, making it a relatively attractive place to live. To protect the unique flora and fauna of the Galapagos from exotic species requires the adoption of a policy that would enforce limits to the number of tourists allowed to visit the islands and an end to subsidies to the permanent population.

This action was judged to not be feasible. There are too many financial interests involved in Galapagos tourism to expect that any limits will be placed on the number of tourists permitted to go there.

#### **18) *Research introduced species on Galapagos***

Research on the introduction, spread and control of introduced species in the Galapagos Islands will always be necessary and should be financed adequately and continuously, emphasizing the link between basic research and its application to the control of introduced species. SIGAL has become an important and successful means to control the introduction of exotic species to the Galapagos Islands.

This action met only two of the criteria. Although feasible, it will not affect large areas or high biodiversity. Research is sustainable in the sense that its results can be used for a long time. The action does not create a lot of synergy with other actions. There is plenty of money going to the Galapagos for research so there is no gap in financing for research on introduced species in the Galapagos.

### **19) Prevent & control introduced species on Galapagos**

One of the most urgent conservation actions for the Galapagos is to continue to eradicate introduced plants and animals until their populations are reduced to levels that will not affect native species. For example, large areas of all the populated islands are covered by exotic plant species, especially cinchona, guava, a type of blackberry and populations of introduced ants, rats, cats, and dogs, continue to be too large.

USAID/Ecuador financing to prevent and control introduced species in the Galapagos has been judged unfeasible. The prevention of species introductions is extremely expensive as it requires a system of constant vigilance which USAID/Ecuador is not prepared to finance.

## **Contamination**

### **Description of Threat**

Contamination is principally a threat to aquatic biodiversity rather than to terrestrial biodiversity or tropical forests. The principal sources of contamination in Ecuador are pesticides, sewage water, and leakage from solid waste dumps, oil spills, mining operations, industrial emission, and vehicular emissions. These sources generate and release contaminants into the environment without control or treatment and the amount of contaminants is increasing. For example, in 1998 the exploitation of mines released 25,681 tons of contaminants whereas in 2002 they released 71,554 tons. Likewise, the release of contaminants by wood industries increased from 14,930 tons in 1998 to 18,787 tons in 2002.

There are studies of the effects of contamination on biodiversity in Ecuador. One study on highland streams near Quito indicated a shift in aquatic species known from clean water to a fauna dominated by pollution-tolerant groups ((Jacobsen, 1998). Observations by local people living near Amazonian oil operations have indicated that oil spills in the Amazon have affected fish populations. Studies have suggested that fungicides sprayed on banana plantations in the Coastal Region may contaminate rivers and affect downstream shrimp populations in shrimp ponds.

### **Past Actions**

#### **USAID**

USAID's principal activities related to contamination have been related avoiding contamination through the proper use of agricultural pesticides and the reduction of industrial contamination. USAID has not financed activities to reduce contamination from oil production, mining, or vehicles. When USAID financed agricultural production projects, such as the Rural Technology Transfer Project (RTTS) in the 1980's, its environmental regulations required measures to train participating farmers on the safe application of pesticides. A project with OIKOS between 1993 and 2000 introduced technologies to reduce contamination in over 48 industries, such as leather-making, woodworking, and metalworking. Under the 3D project, USAID financed studies for solid waste management in various Ecuadorian cities.

### **Other Institutions**

The Clean Production Center in Quito, set up with IDB funding by the Chamber of Small Industries, has adopted and continues to diffuse much of the technology for reducing contamination that OIKOS developed. Furthermore, OIKOS is still receiving financing from FUNDACYT to work with 120 small blue-jeans factories to reduce contamination. The Municipality of Quito is attempting to reduce contamination of water bodies through the construction of collectors and through the enforcement of regulations. It is also attempting to reduce air pollution through the enforcement of regulations on vehicles and factories. With IDB financing, an air monitoring system has been established in the city. Some private businesses are investing in infrastructure, equipment, training, and monitoring required to reduce the level of contamination attributable to their industrial processes.

### **Current Actions**

#### **USAID**

The ProNorte Project is implementing the Environmental Mitigation and Monitoring Program described in the Environmental Assessment for its agricultural production activities, including training in best use practices of agrichemicals and Integrated Pest Management. The PSUR Program is building and improving public health infrastructure including drinking water systems, sanitation units, garbage collection and recycling systems. By the end of PSUR in 2008, the project will have directly contributed to a 60 % increase in solid waste management in Loja, El Oro, Morona-Santiago and Zamora-Chinchipe Provinces and a 13 % increase nationally (USAID/Ecuador, 2006).

### **Other Institutions**

Many Ecuadorian GOs and NGOs are working on reducing contamination caused by solid and liquid wastes. Municipal governments throughout the country are moving forward on improving conditions of sanitary landfills, disposal of hospital waste, and waste-water treatment plants; the city of Loja has become the model for solid waste management.

### **Needed Actions**

#### ***20) Establish municipal contamination policies***

There is a close link between citizen satisfaction, a key indicator of a stable democracy, and treatment of liquid and solid wastes. Not only must municipal policies must support the treatment of liquid and solid wastes to be eligible for funds for wastewater treatment plants and sanitary landfills but money must be available to construct the treatment infrastructure, such as water treatment plants and sanitary landfills.

This action met only one of the seven criteria. It is feasible and USAID/Ecuador has some experience in helping municipalities to establish anti-contamination policies and construct treatment infrastructure. However, the action would not affect large areas or areas of high biodiversity. It is unlikely to be sustainable, given Ecuador's political instability. There is not much potential for synergy between this action and other conservation actions. Other donors are working on municipal strengthening including policies related to contamination. Also, USAID/Ecuador lack sufficient funds to finance more than a few relatively small treatment facilities.

#### ***21) Strengthen municipal waste treatment capabilities***

Decentralization makes municipal governments responsible for managing liquid and solid wastes and creates the need for environmental departments that require staff trained in the design and management of solid and liquid waste facilities.

This action was judged unfeasible. USAID/Ecuador does not have sufficient funds to finance the number of waste water or solid waste treatment facilities that would be required to make a

significant difference to biodiversity.

## **22) Research effects of contamination**

Research is required on the effects of contaminants on biodiversity and the identification of biological indicators in different ecosystems to support appropriate decisions on how to reduce contamination.

This action met only one of the criteria. Although it is a feasible action, research will not affect large areas of biodiversity or areas with high biodiversity. This type of research requires a number of years. In Ecuador it is unlikely to be sustainable. There are already donors who finance studies of contamination.

## **23) Control & reduce industrial contamination**

Industrial contamination affects aquatic biodiversity. It can be controlled through the adoption of improved production processes.

This action met three of the criteria. It was judged feasible because USAID in the past has financed technical assistance in improved production processes with minimal contamination. The improvements are likely to be sustainable. Private industry should finance this action because factories should pay for improvements in their production processes.

## **24) Control & reduce pesticide use**

Many Ecuadorian farmers apply inappropriate and often arbitrary amounts of pesticides on some crops, particularly potatoes and tomatoes. They need training in "best use" practices and integrated pest management.

This action met two of the criteria. It is feasible but would affect only small areas and areas without much biodiversity. It is unlikely to be sustainable since farmers could easily revert to their previous practices for pesticide use. There would be little synergy between this action and other conservation actions. Other institutions are involved in pesticide use training.

## **25) Control & reduce mining & oil contaminations**

Action 25 is very important for conserving Ecuador's aquatic biodiversity which is devastated when soil spills into the rivers. Oil spills are very common in Ecuador, as one of the trans-Andean pipelines has not been well-maintained. Oil spills tend to contaminate water, affecting aquatic biodiversity.

This action was judged unfeasible. USAID/Ecuador can exert little influence on the private oil companies or on Ecuador's state oil company to control and reduce mining and oil contamination.

## **Selection of Priority Actions**

In the previous section, 25 actions that are needed to conserve Ecuador's biodiversity and tropical forests were identified. Eight of these actions address the threat of conversion of habitat; eight address the threat of over exploitation; three address the threat of introduced species; and six address the threat of contamination.

Seven of the needed actions were judged unfeasible and were eliminated from further consideration. Of the remaining 18 actions, eight meet six or less of the selection criteria. They too were eliminated from further consideration. The remaining ten needed actions met six or seven of the selection criteria. The assessment team recommended these actions to USAID/Ecuador for financing during the period 2007 to 2012.

Table 16 indicates these priority conservation actions by their name, category of threat they

address, type of action, and number of criteria which they met.

**Table 16 Priority conservation actions for USAID/Ecuador financing, 2007 to 2012**

Priority USAID/Ecuador Action	Type of Action	Number Criteria Met
<b>Conversion of Habitat</b>		
Consolidate indigenous territories	Policy & Legal	7
Strengthen indigenous organizations	Institutional	6
Strengthen SNAP financing	Institutional	7
Establish regular SNAP training	Institutional	7
Establish forest monitoring system	Research	6
Communicate biodiversity values	Communication	7
<b>Over Exploitation</b>		
Promote technical forest management	Management	6
Promote silviculture research	Research	6
Research key faunal species	Research	7
Apply Galapagos lessons to SNAP	Institutional	7
<b>Introduced Species</b>		
none		
<b>Contamination</b>		
none		

## Recommended Conservation Programs

It would be difficult for USAID/Ecuador to administer ten different priority conservation actions. For that reason, the ten priority actions were grouped into two conservation programs.

The first program, "Conservation in Indigenous Territories," includes the four priority actions that take place in indigenous territories (consolidate indigenous territories, strengthen indigenous organizations, promote forest management, promote silviculture research). The second program, "Conservation in Protected Areas," includes the four priority actions that would occur in national protected areas (strengthen financing for SNAP, train SNAP staff, research key faunal species, apply Galapagos lessons to SNAP). Additionally, two priority actions support both of the conservation programs (establish permanent forest monitoring, communicate biodiversity values).

Of the ten priority conservation actions, one concerns policy and law, four concern institutional strengthening, one concerns management, three concern research, and one concerns communication. Table 17 indicates this grouping of the priority conservation actions, the type of action, and potential synergies between the actions.

**Table 17 Assignment of priority actions to USAID/Ecuador programs and potential synergies**

<b>Program/Priority Actions</b>	<b>Type of Action</b>
<b>Conservation in Indigenous Territories</b>	
(1) Consolidate indigenous territories	Policy and Legal
(2) Strengthen indigenous organizations	Institutional
(3) Promote forest management	Management
(4) Promote silviculture research	Research
<b>Conservation in Protected Areas</b>	
(5) Strengthen financing for SNAP	Institutional
(6) Regular training for SNAP staff	Institutional
(7) Research key faunal species	Research
(8) Apply Galapagos lessons to SNAP	Institutional
<b>Both Programs</b>	
(9) Establish permanent forest monitoring	Research
(10) Communicate biodiversity values	Communication

## Opportunities for Synergies

There are three types of opportunities for synergies related to the recommended priority conservation actions. First, the priority actions can be synergistic between themselves. Second, the priority actions can be synergistic with other actions financed by USAID/Ecuador under its four Strategic Objectives. Third, the priority actions can be synergistic with the conservation actions of Ecuadorian public and private institutions and of other donors.

## Synergies among Priority Actions

There are many potential synergies among the ten priority conservation actions and the following sections discuss some of them. Table 18 summarizes the synergies among priority conservation actions.

### Consolidate indigenous territories

Three important synergies relate to the action of "Consolidate indigenous territories." Uncertain land title creates divisions among indigenous peoples. Outside influences, especially those companies or people that want to gain control over the natural resources in indigenous territories frequently stimulate internal conflicts. Land consolidation, therefore, will contribute to the strengthening of indigenous organizations. Forest management is difficult without a clear land title and boundaries. The title provides confidence that it is worthwhile to embark on an enterprise as long-term as forest management. The clear boundaries make possible mapping of forest types, calculation of resource volumes, and planning of extraction routes and techniques. The SNAP and indigenous territories overlap in many places. Until these overlaps are clarified and resolved, it is difficult to manage effectively either the SNAP or the indigenous territories. Part of the process of consolidating indigenous territories is to resolve such conflicts in ways that are satisfactory to both the SNAP and the indigenous peoples.

### Strengthen indigenous organizations

While land consolidation will strengthen indigenous organization, strengthened indigenous organizations will be better able to consolidate their title to their traditional territories. In a situation where so many laws and regulations contradict each other the winners and losers often result from institutional capacity rather than from correct application of laws and regulations. Strengthened indigenous organizations will be more able to administer forestlands according to a forest management plan. Part of the income from forest management could be used to fund the operations of the indigenous organizations, thus strengthening them. Strengthened indigenous organizations will be more able to oversee and participate in forest monitoring, an essential



ingredient of consolidation of indigenous territories and of forest management.

### **Promote forest management**

The purpose of forest management is to establish a profitable business based on the continuous production of marketable forest products and services from a unit of forestland. Successful management of indigenous forestland, therefore, will provide funds for the operation of indigenous organizations and for the consolidation of indigenous territories. Part of forest management will be applied research on silviculture practices that result in a forest that is more productive of higher quality products and services while protecting biodiversity.

### **Promote silviculture research**

Basic and applied silviculture research forms the building blocks of sustainable forest management.

### **Strengthen financing for SNAP**

A well-financed SNAP will be a stronger institution that will be more able to resolve superimposed claims on indigenous territories and to finance a permanent training program for its staff, research on key endangered faunal species and the application of Galapagos lessons to the rest of SNAP.

### **Train SNAP staff**

Training for SNAP staff will be more able to resolve superposition of the SNAP with indigenous territories and the application of Galapagos lessons to the rest of the SNAP.

### **Research key faunal species**

Research on key faunal species will support forest management and silviculture research. The research will focus on those animal species that play an important role in the regeneration of commercial forest plants.

### **Apply Galapagos lessons to SNAP**

This action will take advantage of synergies between lessons from the Galapagos in order to strengthen the overall SNAP system, beginning with the coastal areas. The Galapagos lessons could be an important part of the training for SNAP staff and could indicate research methodologies for endangered faunal species. The example of the role that the Darwin Station plays in support of the Galapagos National Park could serve as an example of synergy between continental research stations and the continental SNAP.

### **Establish permanent forest monitoring**

Permanent forest monitoring will provide data that will help to consolidate indigenous territories. For example, such monitoring will indicate where there are invasions by colonists of indigenous territories and will provide data for use in the preparation of forest management plans. The data will be useful for planning and implementing silviculture research and for controlling logging operations within indigenous territories.

### **Communicate biodiversity values**

Communication of biodiversity values will build public support for both the SNAP and for the establishment of indigenous territories and thus aid the implementation of all the other priority actions.

**Table 18 Potential synergies between the priority conservation actions**

<b>Program/ Priority Actions</b>	<b>Potential Synergies between Priority Conservation Actions</b>
<b>Conservation in Indigenous</b>	

<b>Program/ Priority Actions</b>	<b>Potential Synergies between Priority Conservation Actions</b>
<b>Territories</b>	
(1) Consolidate indigenous territories	Less conflict strengthens institutions Permits forest management Reduces conflicts with SNAP
(2) Strengthen indigenous organizations	Aids consolidation of indigenous territories Increases capacity for forest management Aids forest monitoring
(3) Promote forest management	Provides funds for indigenous organizations Aids consolidation of indigenous territories Provides funds for silviculture research
(4) Promote silviculture research	Basis for profitable and sustainable forest management
<b>Conservation in Protected Areas</b>	
(5) Strengthen financing for SNAP	Permits institutional strengthening Resolve superimposition with indigenous territories Finances training program Finances research on key faunal species Permits application of Galapagos lessons
(6) Train SNAP staff	Resolves superposition with indigenous territories Permits application of Galapagos lessons to other areas
(7) Research key faunal species	Supports forest management Supports silviculture research
(8) Apply Galapagos lessons to SNAP	Supports training for SNAP staff Examples of research on faunal species
<b>Both Programs</b>	
(9) Establish permanent forest monitoring	Provides data for consolidation of indigenous territories Provides data for forest management Strengthens protection of the SNAP
(10) Communicate biodiversity values	Creates public support for SNAP Creates public support for indigenous territories Raises consciousness about biodiversity and forest conservation

### ***Synergies between USAID/Ecuador Actions and other Strategic Objectives***

Many synergies exist between the ten priority conservation actions and actions in other Strategic Objectives (SO) that USAID/Ecuador intends to finance. Since all four SOs will finance similar types of actions, mostly related to strengthening local governance and local economic development, many of the synergies between the different SOs and the priority actions are similar (Table 19).

#### **Consolidate indigenous territories**

The consolidation of indigenous territories found within the alternative development area will increase satisfaction with local and national government of indigenous peoples, since their main aspiration is to obtain titles to their traditional lands. Moreover, assisting the consolidation of indigenous lands along the northern border is the key to control these large areas, as indigenous peoples are powerful allies in controlling illegal activities related to the drug trade on their lands.

#### **Strengthen indigenous organizations**

This priority action will also strengthen civil society since indigenous organizations are part of civil society. Strengthened indigenous organizations will be more capable of making policy contributions, monitoring the accountability of elected officials and the use of public funds, contributing to democratic debate about economic policies, and mediating conflicts. Actions to

strengthen civil society could include strengthening of indigenous organizations.

### **Promote forest management**

Technical forest management will contribute to democratic governance and local economic growth. Forest products are the most valuable renewable resource in some parts of Ecuador. Promotion of forest management, in way that produces income and protects biodiversity, will thus contribute to the growth of local economies and the local tax base. Efforts to promote local economic development could include efforts to promote the conditions for profitable technical forest management.

### **Promote silviculture research**

Silviculture research is the basis for forest management since its results indicate how to regenerate commercial species of trees and other forest products without affecting biodiversity excessively. Indigenous people should be closely involved in silviculture research because they retain considerable knowledge about the ecological characteristics of forest tree species and because they control the forest areas where silviculture research needs to be carried out. Silviculture research should interact productively with forest monitoring, since forest monitoring can identify the geographic distribution of some forest tree species. Silviculture research should interact also with research into the populations of key faunal species.

### **Strengthen financing for SNAP**

Few municipal services are so important, for both economic growth and human health, as the provision of clean, abundant water. The example of the Quito Water Fund (FONAG) has demonstrated the potential for financing conservation in some protected areas with water user fees. A number of municipalities in the Highland Region obtain part of their water supplies from watersheds that lie inside of protected areas. There is an excellent opportunity, therefore, for replicating the model of FONAG to other Highland Region municipalities. Likewise, actions to construct municipal water systems could support the establishment of water funds.

### **Train SNAP staff**

Well-trained SNAP staff will improve their management of protected areas, making them more attractive for ecotourism enterprises that help the local economy.

### **Research key faunal species**

Research on key faunal species will be synergetic with a number of the other priority actions such as forest management. It will also contribute to silviculture research, for the same reason; it will be particularly important to silviculture research when an animal plays an important role in the regeneration of a commercial tree species.

### **Apply Galapagos lessons to SNAP**

The Galapagos National Park has become a major source of income to the Ecuadorian economy. Application of lessons from the Galapagos National Park to coastal components of the SNAP will help ecotourism enterprises, adding to the growth of the local economy.

### **Establish permanent forest monitoring**

Forest monitoring system will contribute to the capability of local governments to plan and regulate the use of the forest within their jurisdictions. Involvement of local governments in the forest monitoring system will increase its feasibility and sustainability.

### **Communicate biodiversity values**

The communication of biodiversity values to local public and private decision-makers will improve local civil society and government planning for the provision of services and for local economic

development.

**Table 19 Synergies between priority actions and USAID/Ecuador SO actions**

Program/ Priority Action	Illustrative synergies by Strategic Objectives			
	More Effective, Democratic,, & Transparent Local Governance	Sustainable Alternative Development	Southern Border	Improved Natural Resources Management, Trade, Competitiveness
<b>Conservation in Indigenous Territories Program</b>				
Consolidate indigenous territories	Political stability	Political stability	More stability	More investment
Strengthen indigenous organizations	Reduced conflict Better policies Better planning	More stability	More stability	More investment
Increase technical forest management	Better products	Better products	Better products	Better products
Research silvics and silviculture	Better products	Better products	Better products	Better products
<b>Conservation in Protected Areas Program</b>				
Increase financing for SNAP	Reliable water supplies	Reliable water supplies	Reliable water supplies	More investments
Permanent training for SNAP staff	Improved local economy	Improved local economy	Improved local economy	Improved local economy
Apply Galapagos lessons to coastal SNAP	More ecotourism	More ecotourism	More ecotourism	More ecotourism
<b>Both Programs</b>				
Establish forest monitoring system	Better municipal planning	Better municipal planning	Better municipal planning	More competitiveness
Communicate biodiversity values	More ecotourism	More ecotourism	More ecotourism	More ecotourism

### ***Synergies with Ecuadorian and Other Donor Conservation Actions***

Other Ecuadorian and donor conservation actions offer possibilities for synergy with the ten recommended USAID/Ecuador priority actions, thus adding value to all conservation actions. Table 20 indicates some of these potential synergies for the Government of Ecuador and six of the principal donors (GTZ, SCA, OCTA, UNDP, IDB, WB/GEF) for conservation in Ecuador.

#### **Consolidate indigenous territories**

The consolidation of indigenous territories depends on the Ecuadorian Institute for Agricultural Development (INDA), the government agency with principal authority over land titling. The Amazon Cooperation Treaty Organization (OCTA) has a program to support the consolidation of indigenous territories with which USAID/Ecuador should cooperate, particularly when the Amazon Basin

Conservation Initiative (ABCI) begins operations.

### **Strengthen indigenous organizations**

The Ministry of Social Welfare has a sub-secretariat of indigenous affairs; it would be beneficial for USAID/Ecuador to coordinate with this Ministry to strengthen indigenous organizations. The GTZ supports the strengthening of several Chachi centers in northwestern Ecuador; the OCTA has a program to strengthen indigenous organizations at all levels in the Amazon Basin; and the World Bank is funding the PRODEPINE project to strengthen indigenous organizations.

### **Promote forest management**

The forestry department of the Ministry of Environment should be involved in the design and implementation of this priority action. The GTZ has accumulated experience in forest management by indigenous peoples in Ecuador. Also, the Inter-American Development Bank is promoting forest management in the northern Sucumbíos Province.

### **Promote silviculture research**

Ecuadorian technical universities can and should be involved in the design and implementation of silviculture research, particularly the forestry schools of Loja, Ibarra and Quevedo. The Durini Foundation has carried out silviculture research on their properties for over two decades.

### **Strengthen financing for SNAP**

The Water Fund for Quito should interact synergistically with the financial strengthening of the SNAP, the GTZ municipal strengthening project, and the GEF II SNAP project.

### **Train SNAP staff**

Training SNAP staff will be synergistic with all Ecuadorian and donor projects that support the SNAP, as a better-trained staff will function more effectively.

### **Research key faunal species**

The principal synergies for research on key wildlife are with Ecuadorian universities and museums, environmental NGOs such as EcoCiencia, Jatun Sacha, San Francisco and Wildlife Conservation Society (WCS), and other scientists and academic institutions that do research on forest animals.

### **Apply Galapagos lessons to SNAP**

The principal possibilities for synergy in applying lessons from the Galapagos to the rest of the SNAP are with Galapagos-based institutions such as the Galapagos National Park (GNP), the Darwin Station, and many donor organizations that work in the Galapagos, such as the Spanish Cooperation Agency (SCA) and international environmental NGOs, such as the World Wildlife Fund, Conservation International and The Nature Conservancy.

### **Establish permanent forest monitoring**

The Center for Remote Sensing (CLIRSEN) is the principal opportunity for synergism in implementing this priority action. CLIRSEN has many years of experience and the equipment to do digital imaging. Ecuadorian environmental NGOs, such as Ecociencia, Jatun Sacha and the Center for Conservation Data (CDC), also have remote sensing experience and capabilities.

### **Communicate biodiversity values**

Many Ecuadorian NGOs have proven capable of designing and implementing excellent environmental communication programs.

**Table 20 Synergies: Priority conservation actions with other GOE and donor actions**

Priority Action	Ecuadorian	Other Institutions					
		(GTZ)	SCA	(OCTA)	(UNDP)	(IDB)	(WB & GEF)
Consolidate indigenous territories	INDA titling programs	none	none	Consolidation of indigenous territories	none	none	none
Strengthen indigenous organizations	Ministry of Social Welfare	Assistance to Chachis	none	Strengthening of indigenous organizations	none	none	PRODEPINE
Promote forest management	MAE, forestry department	forest management projects	none	unknown	none	forest management in Sucumbios	none
Research silvics and silviculture	Ecuadorian universities, Durini Foundation	applied silviculture research	none	none	none	None	none
Increase financing for SNAP	Water Fund of Quito	None	Experiences in Galapagos National Park	none	none	none	GEF II SNAP
Permanent training for SNAP staff	none	none	none	none	none	none	none
Research key faunal species	EcoCiencia, Jatun Sacha and other NGOs do research on fauna	none	none	none	none	none	none
Apply Galapagos lessons to SNAP	GNP & MAE parks department, Darwin Station	none	Work with fishing coops in Galapagos	none	Many Galapagos activities	none	none
Establish forest monitoring system	CLIRSEN, Ecociencia, Jatun Sacha & other NGOs	digital imaging of forests in Esmeraldas	none	none	Monitoring & evaluation systems for biodiversity	none	none
Communicate biodiversity values	OIKOS, F. Natura, EcoCiencia, etc.	publications	none	Environmental education programs	none	none	publicity regarding biodiversity

## Environmental Assessment of Proposed Program Actions

Sections 118 and 119 of the Foreign Assistance Act (FAA) require that this assessment review the potential effects on tropical forests and biodiversity of the entire proposed USAID/Ecuador FY 2007 to 2012 Strategy. On the one hand, some of the strategy's proposed actions may negatively affect Ecuador's tropical forests and biodiversity. Road construction or improvement, for example, may cause direct negative impacts by clearing forest and indirect negative impacts by increasing agricultural colonization and therefore deforestation. On the other hand, even if that is not their principle objective, the proposed actions may serve to conserve Ecuador's tropical forests and biodiversity. To protect the water supplies of municipal water systems, for example, may require the permanent protection of the water source. Such protection could help to conserve natural vegetation and therefore biodiversity and forests.

Every proposed USAID activity is subject to an environmental review process that starts with the preparation of an Initial Environmental Evaluation (IEE). If the proposed activity meets the criteria established in the USAID environmental regulations (22 CFR 216) the IEE may recommend a Categorical Exclusion for the activity, in which case no further environmental review is required. The IEE itself may recommend measures to avoid, mitigate, or compensate for negative environmental impacts, including those on biodiversity or tropical forests. If the potential negative environmental effects are significant and mitigation measures have not already been defined, then the IEE may recommend the preparation of an Environmental Assessment (EA) or a Programmatic Environmental Assessment (PEA).

USAID/Ecuador has not yet chosen the actions that it will finance under the Strategic Plan FY 2007 to 2012 Strategy. As it determines what actions it will finance, USAID/Ecuador will follow the environmental review process required by 22 CFR 216. This process will identify the potential negative effects of proposed actions on Ecuador's biodiversity and tropical forests. They would also identify the changes in activity design, or the measures to avoid, mitigate, or compensate for the negative effects on biodiversity and tropical forests of the proposed actions. Although not required, USAID/Ecuador could also utilize the environmental process to identify ways in which a proposed activity could support the conservation of Ecuador's biodiversity and tropical forests. This assessment cannot substitute for the environmental review process, since that process is a requirement that is additional to this assessment.

Nonetheless, the draft data sheets for the proposed programs do list illustrative actions, as indicated in Table 21. Many of these illustrative actions are quite similar. Table 21, Column 1, consolidates the illustrative actions into seven categories. Columns 2 and 3 indicate potential positive and negative impacts on Ecuador's biodiversity and tropical forests of these types of activities. Column 4 indicates some potential mitigation measures for the negative impacts on biodiversity and tropical forests.

**Table 21 Potential positive and negative impacts USAID/Ecuador 2007 to 2012 Strategy**

Category of Activity	Environmental Impact		Potential Mitigation Measures
	Positive	Negative	
Improve government	Increased control	none	none
More economic growth	Increased conservation funds	More contamination	Agrochemical training Environmental audits
Improve health care	none	More medical wastes	Safe disposal
Improve education	none	none	none
Improve conservation	Conservation	none	none
Improve water supply	Conservation of watersheds		
Improve sanitation	More waste treatment	none	waste treatment

Note that many of the illustrative actions and mitigation measures indicated in Table 21 correspond to the actions that were previously identified as those needed to conserve Ecuador's biodiversity and tropical forests. The needed actions to reduce the contamination in aquatic environments that affect aquatic biodiversity, for example, involve the construction and operation of improved water and sanitation systems. Likewise, the protection of the water sources for electricity, agriculture, industry, and human use, through the conservation of natural vegetation will also protect biodiversity.



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BirdLife International, Ecuador; listing of threatened and endangered bird species; [www.birdlife.org/worldwide/national/ecuador/index.html](http://www.birdlife.org/worldwide/national/ecuador/index.html)

Ecuador – National System of Protected Areas Project Vol. 1; World Bank; [www.worldbank.org](http://www.worldbank.org)

Ecuador Country Analysis Brief; US Department of Energy; [www.eia.doe.gov/emeu/cabs/ecuador.html](http://www.eia.doe.gov/emeu/cabs/ecuador.html)

Areas Protejidas del Ecuador; [www.usfq.edu.ec/1PARQUE/aprotee.html](http://www.usfq.edu.ec/1PARQUE/aprotee.html)

CITES – Listed species database for Ecuador; <http://sea.unep-wcmc.org/isdb/CITES/Taxonomy/country/>

IUCN/World Commission on Protected Areas; Protected Areas and World Heritage; [www.unep-wcmc.org/protected\\_areas/categories/index.html](http://www.unep-wcmc.org/protected_areas/categories/index.html)

United Nations Convention to Combat Desertification – Ecuador; [www.unccd.int/php/countryinfo/](http://www.unccd.int/php/countryinfo/)

Convention on Biodiversity – Ecuador; [www.biodiv.org/world/map.aspx](http://www.biodiv.org/world/map.aspx)

The List of Wetlands of International Importance, RAMSAR Convention – Ecuador; [www.ramsar.org/sitelist.pdf](http://www.ramsar.org/sitelist.pdf)

Ministerio del Ambiente, Republica del Ecuador; [www.ambiente.gov.ec](http://www.ambiente.gov.ec)

Biodiversity and Protected Areas – Ecuador; <http://earthtrends.wri.org>

Ecuador's Environmental Legislation; Natural Resources – Ecuador; Environmental and Natural Resources Law Programs – University of Denver; [www.law.du.edu/naturalresources/](http://www.law.du.edu/naturalresources/)

**Appendix 1 Terms of Reference****SCOPE OF WORK**

USAID/Ecuador

TROPICAL FOREST AND BIODIVERSITY COUNTRY ANALYSIS (FAA 118 & 119)

**PURPOSE**

The purpose of this task is to conduct an assessment of tropical forest and biodiversity conservation needs in order to comply with sections 118 and 119 of the Foreign Assistance Act (FAA) of 1961, as amended, and country strategy guidelines under ADS 201.3.8.2. Based on this assessment, the selected Contractor will assist USAID/Ecuador in defining how the Mission's new five-year country program strategy (2008-2013) contributes to meeting Ecuador's biodiversity and tropical forest conservation needs, as required by agency regulations. This assessment will also serve as a planning tool to assist the Mission in better integrating environment issues into its overall program.

**BACKGROUND**

USAID/Ecuador is required to prepare a Strategic Statement for the new country program strategy, in accordance with the guidance of the Latin America and the Caribbean (LAC) Strategic Framework. This document lays out the priority strategic directions for Ecuador for the next five years.

The Strategy Statement guidance for programs under the LAC Regional Strategic Framework states that Missions must address the Agency-wide statutory biodiversity and tropical forestry requirements. As part of the strategic planning process, Missions must include an analysis of biodiversity and tropical forest conservation needs in their country and the extent to which proposed programs address the needs identified. This assessment will be an annex of the statement.

Given that USAID/Ecuador's most recent 118-119 Analysis was conducted in 1989, the Mission will conduct a broader analysis to guide the Mission in the development of its environmental activities and to inform how the Mission could include environmental concerns in the new country program strategy.

Currently, USAID/Ecuador is in the process of developing the Strategic Statement and identifying new strategic objectives and areas of intervention. The Strategic Statement and annexes are to be submitted to USAID/Washington on March 6, 2006. Country strategy statements will not be approved without the mandatory 118-119 analyses.

**STATEMENT OF WORK**

Requirements for biodiversity analysis are set out by the Foreign Assistance Act (FAA) as amended Section 119(d) Endangered Species: "Country Analysis Requirements. -- Each country development strategy statement or other country plan prepared by the Agency for International Development shall include an analysis of (1) the actions necessary in that country to conserve biological diversity, and (2) the extent to which the actions proposed for support by the Agency meet the needs thus identified."

Similar language exists for Tropical Forests in Section 118(e): "Country Analysis Requirements. -- Each country development strategy statement or other country plan prepared by the Agency for International Development shall include an analysis of (1) The actions necessary in that country to achieve conservation and sustainable management of tropical forests, and (2) The extent to which the actions proposed for support by the Agency meet the needs thus identified."

The analysis will review the current status of tropical forests and biological diversity in Ecuador, identify actions needed to conserve biodiversity and tropical forests, assess the current and planned activities of other donor programs and stakeholders in meeting these needs, and analyze the planned activities of USAID/Ecuador in reference to the actions needed. .

The analysis shall include:

An overview of the status and trends of Ecuadorian tropical forests and biodiversity, including ecosystem diversity, species diversity, threatened and endangered species, genetic diversity, agricultural diversity, ecological processes and ecosystem services, and values and economics of biodiversity and forests.

An overview of the social, economic, and political context for sustainable natural resources management and the conservation of biodiversity and forests, including the social and economic environment; institutions, policies, and laws affecting conservation; the national protected area system including all IUCN categories of protected areas; laws affecting the protection of endangered species; and participation in international treaties.

Assessment of the factors affecting the management of these natural resources, including direct and indirect threats and opportunities to sustainable management of tropical forests and biological diversity in Ecuador.

Review and summary of government, NGOs, private sector and donor programs and activities that contribute to conservation of Ecuadorian tropical forests and biodiversity, and an assessment of their effectiveness, strengths and weaknesses.

A list or description of the actions necessary to conserve biodiversity and forests logically flowing from the review of the threats, and what is currently being done by government, NGOs, and donor programs that address those threats.

Review the legislative basis, both national and local, for the protection of biological resources, including tropical forests in Ecuador (i.e. the Ecuadorian Forestry Law and proposed Biodiversity Law).

Review private/commercial sector aspects of the forestry and wood industry, including non timber forest products, and including an analysis of national and international markets.

Identify the priority actions (which are cost effective and implementable) necessary to achieve sustainable management of tropical forests and the conservation of biological diversity in Ecuador.

Identify the extent to which current or proposed programs of other donors meet these identified needs.

Identify the extent to which the actions proposed for support by USAID/Ecuador meet the identified needs. Point out any implementation constraints that USAID/Ecuador might encounter in implementing these actions. Recommend any further actions for USAID/Ecuador to consider that are not described or outlined in the Strategic Statement.

Analyze the effects of USAID/Ecuador's entire proposed strategy (FY 2008 – FY 2013) on Ecuador's tropical forests and biodiversity. Review proposed USAID/Ecuador strategy statement and program, including all new SOs, Alternative Development, Economic Opportunities, Environment, and Democracy and Governance, followed by an analysis of the extent to which actions proposed for support by USAID help meet the needs identified. Point out any threats to biodiversity and forests from activities proposed for USAID support, and suggest mitigating actions. Identify opportunities for cross-cutting, cross-sectoral linkages with proposed activities (for all proposed SOs); especially those that would be low cost and/or would enhance the effectiveness of the proposed activities.

The task includes, but is not limited to:

1. Review at least the following documents (to be provided by USAID/Ecuador):

ADS 201.3.8.2. Environmental Analysis. January 31, 2003.

FAA 118 [http://www.usaid.gov/our\\_work/environment/compliance/faa\\_section\\_118.htm](http://www.usaid.gov/our_work/environment/compliance/faa_section_118.htm)

FAA 119 [http://www.usaid.gov/our\\_work/environment/compliance/faa\\_section\\_119.htm](http://www.usaid.gov/our_work/environment/compliance/faa_section_119.htm)

22 CFR 216

LAC Regional Strategic Framework (November 14, 2005)

Strategy Statement Guidance for Programs Under the LAC Regional Strategic Framework (December 20, 2005).

Tropical Forestry and Biodiversity (FAA 118 and 119) Analyses: Lessons Learned and Best Practices from recent USAID experience. September 2005.

[http://pdf.dec.org/pdf\\_docs/PNADE195.pdf](http://pdf.dec.org/pdf_docs/PNADE195.pdf)

USAID/Ecuador's FY 2006 and 2007 Congressional Budget Justification – Data Sheets. December 16, 2005.

Other evaluations and assessments, including the 1989 USAID/Ecuador FAA 118 and 119 Analysis, other USAID Mission 118-119 Analyses as appropriate, "Conserving Biodiversity in the Amazon Basin: Context and Opportunities for USAID—May 2005"

Meet with USAID Mission for an initial briefing and discussion of the content and deliverables associated with the SOW.

Conduct an independent consultation with stakeholders other than USAID, i.e. government agencies, local and international NGOs, other international donors, indigenous communities, and the private sector. The contactor will also coordinate with USAID experts provided by USAID/Ecuador.

Field visits as necessary.

Develop and provide the Mission with recommendations.

Assessment Team: The FAA 118-119 analysis must address a variety of issues, including biological, economic, institutional, legal and policy factors relevant to USAID programming. The Contractor will ensure that all necessary disciplines within the context of sustainable tropical forest management and biodiversity conservation are applied appropriately in performing this analysis.

The assessment team will be composed of two senior experts (residents in Ecuador). The team members should be familiar with Ecuador, its economic and political environment and policy constraints. Expected team qualifications are the following:

Biodiversity and/or Tropical Forest Expert – Team Leader:

Strong applied professional background (Ph.D.) in biology, forestry, or closely related field in natural resources management or natural resources economics.

Significant experience (10 years) in the design and management of sustainable tropical forest management and natural resource management programs in Latin America (preferably with experience in Ecuador), including:

tropical forest management and sociological and anthropological aspects of natural resource management  
best practices in biodiversity conservation

In-depth knowledge of USAID environmental programs in Latin America. Demonstrated experience in assessing development programs for impacts on environment and tropical ecosystems and of environmental impact assessments.

Knowledge of USAID strategic planning process related to Tropical Forestry and Biodiversity (FAA Sections 118 and 119), and 22 CFR 216.

Demonstrated ability of team management.

Ability to communicate effectively in Spanish and English.

Have exceptional organizational, analytical, and writing skills in English and Spanish.

Have recognized strong interpersonal skills, sufficient to smoothly relate to a wide variety of stakeholders at all levels.

**Environmental Specialist:**

Strong applied professional background (Master) in biology, forestry, or closely related field in natural resources management or natural resources economics, with 5 years of experience in conservation of biological diversity or protected area management in Latin America, preferably in Ecuador.

In-depth knowledge of USAID environmental programs and procedures, preferably in Latin America.

Knowledge of USAID strategic planning process related to Tropical Forestry and Biodiversity (FAA Sections 118 and 119), and 22 CFR 216.

Ability to communicate effectively in Spanish and English.

Have exceptional organizational, analytical, and writing skills in English and Spanish.

Have recognized strong interpersonal skills, sufficient to smoothly relate to a wide variety of stakeholders at all levels.

**USAID involvement:** The contractor team will work in close coordination and communication with USAID/Ecuador staff, particularly with the Regional Environmental Officer, all current SO Team leaders and the Mission's Program Office. The Regional Environmental Officer will be the primary point of contact for the contractor. The contractor will report directly to the Regional Environmental Officer. If deemed appropriate by the Mission, the Regional Environmental Officer will participate in field trips and meetings with stakeholders.

The Mission will provide a list of key stakeholders/partners and their contact information for the contractor to use.

**Period of Services:** The analyses are to commence o/a January 30, 2006, for a period of approximately 15 working days, terminating o/a February 17, 2006.

**Logistic Support:** The contractor will be responsible for all logistical support and arrangements for the implementation of this contract.

**Deliverables and Reporting Requirements:** During the first 2 days the contractor will submit a work plan with a detailed description of how the task will be carried out and a timeline, which will be subject to Mission approval.

The report must clearly meet the legal requirements of FAA 118 and 119. The final report should not exceed forty (40) pages (excluding annexes) and should be submitted in English and Spanish. Initial drafts should be submitted in English only. Twenty copies of the final report (20 in English and 20 in Spanish) will be submitted to USAID/Ecuador. The final report and all annexes shall be provided in both hard copy and electronic formats (Microsoft Word 2000 on CD). The final report is due on February 24, 2006. The contractor will send a copy of the final report to PPC/CDIE/DI in Washington.

The contractor will produce a complete draft report for review and comments by USAID/Ecuador. Upon delivery of the draft report, the contractor will give a debriefing to USAID/Ecuador of initial

results on February 17, 2006. USAID/Ecuador will have three days to provide comments to the contractor on the draft report. The Team Leader has final responsibility for delivery of the final report.

The contractor will also deliver overlay maps of these themes: 1) potential natural vegetation; 2) forest cover and/or land use; 3) protected areas of all IUCN categories; 4) land or other resource tenure; 5) indigenous territories. Maps should be in scale 1:250,000.

#### Report Structure:

The content of the report should be as follows:

**Executive Summary** (no more than 5 pages): This section should include the following: summarize the two-part legal requirements of FAA 118 and 119, describe the actions necessary to achieve conservation and sustainable management of tropical forests and/or biodiversity in Ecuador, analyze the extent to which the actions proposed for support by USAID/Ecuador and other donors meet the needs thus identified.

identify gaps in the needs versus proposed activities and recommend how USAID/Ecuador's investment can best meet the identified needs and add value to the investments of the Government of Ecuador and other donors.

**Introduction:** purpose and objective of the analyses.

**Methods:** methodology to carry out the analyses.

**Status of Biodiversity in Ecuador:** Overview of the status and trends of Ecuadorian tropical forests and biodiversity, including ecosystem diversity, species diversity, threatened and endangered species, genetic diversity, agricultural diversity, ecological processes and ecosystem services, and values and economics of biodiversity and forests. This section should include maps or other images that facilitate visualizing integration of proposed activities across thematic areas of the Mission's SO teams. Overlay maps of these themes shall be included, as annexes: 1) potential natural vegetation; 2) forest cover and/or land use; 3) protected areas of all IUCN categories; 4) land or other resource tenure; 5) indigenous territories.

**Status of Tropical Forests in Ecuador:** Describe the status and conservation needs of tropical forests, similar to those for biodiversity.

Social, Economic, and Political Context:

Relevant facts and appropriate analysis about the social, political and economic environment in the country that affect biodiversity conservation and tropical forests. In part, this shall include relevant analyses of specific constraints and opportunities for USAID/Ecuador to consider addressing indigenous and gender issues in its environment and related programs.

Discuss the governmental institutions, policies and laws affecting the sustainable management and conservation of biodiversity and forests, and their enforcement and effectiveness.

**Government, NGO, and donor programs and activities:** Review of programs relevant to biodiversity and tropical forest conservation. This shall include an assessment of the effectiveness of these programs, and their potential links with USAID program activities to identify gaps and unmet needs.

**Threats to Biodiversity:** Describe direct threats including, but not limited to, habitat conversion, overexploitation, introduced non-native species, pollution and macro-environmental change) and indirect threats and root causes including, but not limited to, demographic change, poverty, insecure land or resource tenure, institutional capacity, economic policies, global market forces, corruption, social and cultural change.

**Actions needed to conserve biodiversity and forests:** List of necessary actions. This shall include an analysis of needs in relation to the current and projected activities of other donors' programs and those of the Government of Ecuador at national and local levels.

Links to USAID strategy and program:

Analysis of the extent to which proposed USAID/Ecuador actions meet the identified needs.

Recommended activities for USAID/Ecuador to consider in its proposed environment and other SO team programs.

Identification of potential constraints for USAID/Ecuador in implementing the proposed activities

Identification of negative impacts from proposed USAID activities

Recommendations to mitigate or avoid these potential negative impacts.

Identification of opportunities for linkages among USAID/Ecuador environment activities and other USAID sectors.

Identification of opportunities for linkages and adding value to other donor and GOE programs

**References cited:** Documents or web-based sources of information.

**Abbreviations and acronyms:** List of all abbreviations and acronyms used in the document.

**Annexes:** This section should include:

The Scope of Work of the analyses

Persons and organizations contacted, including their address and contact information

Other relevant information (i.e. maps)



## **Appendix 2 Qualifications of Assessment Team Members**

### **Margaret Stern (Biodiversity and Tropical Forest Expert)**

Margaret Stern is a tropical forest ecologist with a Masters (1986) and Ph.D. (1992) in Evolution and Ecology from the University of California, Davis. She is a US citizen, resident in Ecuador, with 25 years experience studying tropical ecosystems and conducting applied research on topics related to environmental conservation and management of natural resources, particularly in Andean and Amazonian countries. Dr. Stern is an independent consultant based in Quito and has carried out studies and project assessments for USAID-funded projects in Mexico (Eco-Development project) and Ecuador (CAIMAN, ProNorte); local and international conservation NGOs (Fundación Natura, Corporación Botánica Ecuadendron, ProNaturaleza, Conservation International, WWF, Altropico); the governmental environmental authority in Peru (INRENA); and private businesses (Tropimaderas S.A.; forest certification evaluation for SmartWood). She is presently providing consultant services to ARD, Inc. to implement the Environmental Mitigation and Monitoring Plan to ensure that ProNorte is complying with USAID's Environmental Procedures 22 CFR 216. Over the last five years, she has researched and published on the social and environmental impacts of illegal mahogany logging in Ecuador and Peru. She is a recognized specialist on the ecology of American bamboos and is co-author of a book on the subject. Her research includes work with indigenous and colonist communities in Amazonia (Peru and Ecuador) with the objectives of delimiting territories for land security, land use planning and forest resource management. Dr Stern maintains one foot in formal academics by regularly teaching intensive tropical ecology field courses to US and Latin American post-graduate students and has done so in Ecuador, Peru and Costa Rica.

### **Bruce Kernan (Forestry and Environmental Specialist)**

Bruce Kernan has a strong applied professional background in forestry and environment and 23 years of experience working on USAID programs related to the conservation of biological diversity, forest management and protected area management in Latin America predominantly in Ecuador, where he has lived since 1983. He has strong capabilities in the analysis, evaluation, and synthesis of multi-disciplinary information for project, program and strategic planning and evaluation. Bruce Kernan has previously prepared Tropical Forest and Biodiversity Country Analyses (FAA 118 & 119) for USAID programs in Peru, Bolivia, and Ecuador as well as numerous environmental assessments, programmatic environmental assessments, and strategic planning documents. He has in-depth knowledge of USAID environmental programs and procedures in Latin America as a result of being the USAID/Ecuador Mission Environmental Officer from 1984 to 1988, USAID Regional Environmental Advisor for South America from 1994 to 1998, and an independent environmental consultant, mostly to USAID from 1999 to the present. He is fluent in written and spoken Spanish. As a frequent Team Leader he has developed excellent interpersonal skills that have enabled him to smoothly relate to a wide variety of stakeholders in all the countries in which he has worked. His education includes a Master of Professional Studies degree in agriculture and environment from Cornell University, a Master of Forest Science degree in silviculture and forestry economics from Yale University, a Bachelor of Arts degree in geology and anthropology from Hamilton College and a certificate in forestry technology from the New York State College of Forestry.

### Appendix 3 USAID/Ecuador Survey Questions and List of Respondents

I. Most-repeated suggestions from 60 email survey respondents about “where and how to implement biodiversity conservation activities and how to make them sustainable”:

Where (listed in order of frequency cited):

Chocó (northwestern Ecuador);  
Galápagos National Park and Marine Reserve;  
Amazon basin;  
Dry coastal forests, incl. Tumbesian forests in the south (Machallila, Arenillas);  
Entire SNAP;  
Western Andean slopes;  
Páramos;  
Chongón-Colonche coastal range;  
Mindó cloud forest;  
Upper watersheds, especially the eastern Andean range and Condor Bioreserve;  
Isolated eastern mountain ranges (Sumaco/Galeras, Kutukú, del Condor);  
Pastaza watershed;  
Manglares-Churute;  
Gulf of Guayaquil and islands;  
RAMSAR wetland sites.

How:

Strengthen and work with local communities and institutions, especially those that will remain viable for a long time;  
Include local stakeholders in entire project process, including design;  
Provide environmental education to communities on topics such as conservation and natural resource management, land use planning & zoning, territory consolidation, laws and paralegals, sustainable agriculture and agroforestry production, ecotourism, handicrafts;  
Support environmentally-sound income-producing activities for local stakeholders and community small-businesses, such as ecotourism (and cultural tourism), development of timber alternatives and forest product certification;  
Place economic value on biodiversity conservation;  
Develop innovative financial instruments (incl. environmental services) for payments to local communities to protect and conserve their natural resources and biodiversity;  
Include and integrate local universities in biodiversity research and conservation efforts;  
Implement biological inventories on poorly known groups of flora and fauna;  
Strengthen and support management of the SNAP;  
Support and strengthen institutions (e.g. Ministry of the Environment) that enforce environmental laws;  
Support national and local policies to strengthen biodiversity conservation and work with government to implement international agreements (esp. CBD);  
Consolidate indigenous territories and support indigenous defense (from external threats) and management of their territories;  
Create new protected areas (traditional and innovative ones that are complementary to the SNAP) and biological corridors (e.g. bird routes) in critical areas and support development of their management plans and sustainable development strategies;  
Decentralize environmental decision-making to municipalities and encourage a democratic decision-making process;  
Establish realistic, practical and measurable project objectives;  
Incorporate conflict management as an effective means to conserve biodiversity;  
Support private conservation reserves (communities, NGOs) and integrate private landowners into conservation, inside and outside of protected areas;  
Support the development of alternatives for co-management and sustainable development of the SNAP and other natural areas;  
Implement landscape-level projects that integrate protected areas, multiple-use areas and areas

critical to conserve biodiversity;  
 Control forestry activities, the over-exploitation of natural resources, and negative environmental impacts of harvest activities;  
 Reforestation and rehabilitation of native forests (esp. on the coast);  
 Mitigate negative environmental impacts of extractive industries through law enforcement and working with civil society to create monitoring groups;  
 Redefine the system of tourism management in Galapagos and reduce or eliminate economic subsidies on the islands to encourage good management and eliminate non-sustainable productive activities;  
 Support economic development in geographic areas that have generated most of the immigrants to Galápagos (parts of Guayas, Manabí, Loja & Tungurahua).

#### Sustainability:

Encourage active participation of rural stakeholders from the beginning of the project;  
 Develop projects that are administrated and managed by local communities;  
 Develop projects in which local communities benefit economically;  
 Work with experienced and committed local partners;  
 Create fiduciary funds to support protected area management costs and combine these with other financial strategies for continuity;  
 Seek longer funding periods for projects and work with other more permanent actors (e.g. FAN) that can match a short-term investment (e.g. USAID);  
 Involve the private sector in funding and program development;  
 Involve universities and municipalities in project implementation;  
 Implement pilot projects (models) that can be replicated throughout the country;  
 Include financial sustainability and autonomy in program strategy;  
 Create national environmental consciousness about the world-wide importance of Ecuador's biodiversity, especially in children and young people;  
 Develop effective strategies to monitor and audit technical and financial project parameters;  
 Generate income through payment for environmental services (e.g. water, CO<sub>2</sub>) and charging fines for illegal or inappropriate use of natural resources.

#### II. List of sixty USAID/Ecuador survey respondents

	Name	Institution
1	Añazco, Mario	CARE
2	Asan, Francisco	Municipal government of Milagro
3	Calderón, Alejandra	SNV
4	Carroll, Ronald	University of Georgia
5	Castillo, Patricia	Independent
6	Centeno, Wellington	Municipal government of Empalme
7	Chiliquinga, Ingrid	Municipal government of Balzar
8	Church, Stephen	Peace Corps
9	Cruz, Eliecer	WWF
10	Cruz, Mercedes	Vice-Mayor, Municipal government of Naranjal
11	Dahik, Alvaro	Director, Fundación Natura, Guayaquil
12	Dionne, Yvan	Samiri-Progea Inc.
13	Dominguez, Catalina	Subsecretary, Fishing Resources
14	Dumas, Juan	Fundación Futuro Latinoamericano
15	Erazo, Mauro	Municipal government of Colimes
16	Factos, Miriam	Director, SNAP-GEF Project
17	Galindo, José	MENTEFACTURA
18	Granizo, Tarsicio	TNC
19	Greenfield, Paul	Mindo Cloudforest, Jocotoco & EcoEcuador Foundations
20	Guerrero, Oswaldo	CORSEFOR
21	Hall, William	USGS

	Name	Institution
22	Jervis, María Helena	Director, Fundación Antisana
23	Justicia, Rebeca	Maquipucuna Foundation & University of Georgia
24	Krohnke, Brian	Mindo Cloudforest Foundation
25	Larrea, Sergio	Coordinator of the Participatory Management Board
26	Lasso, Sergio	Ministry of the Environment
27	Lemmo, Mike	Peace Corps
28	Levy, Jaime	Altropico
29	Linke, Jorge	GTZ
30	Lloret, Pablo	FONAG
31	Lloor, Sandra	Birds & Conservation (CECIA)
32	Martinez, Amado	CESA
33	Matamoros, Antonio	Ministry of the Environment
34	Moncayo, Edgar	Fundación Cerro Verde
35	Montalvo, Tamara	IUCN
36	Mora, Arturo	IUCN
37	Nastacuaz, Olindo	FCAE
38	Ortiz von Halle, Bernardo	TRAFFIC, South America
39	Palacios, Pablo	Fundación Arcandina
40	Queiroz, Joao	Director, CAIMAN
41	Quilumbango, Silvia	DECOIN
42	Rivas, Jorge	Fundación Natura
43	Rodríguez, Fernando	EcoCiencia
44	Ruiz, Walter	National Fisheries Institute
45	Salazar, Santiago	Ministry of the Environment
46	San Martín, Leonor Vera	INOCAR
47	Sanhadji, Karen	US Dept of Interior
48	Suárez, Esteben	WCS
49	Suárez, Luís	Director, Conservation International, Ecuador
50	Symington, Meg	WWF-US
51	Treu-Fowler, Julia	Peace Corps
52	Troya, Roberto, Silvia Benítez & Paulina Arroyo	TNC, Ecuador
53	Urquiza, Isidro	Municipal government of Santa Lucia
54	Valencia, Alexandra	British Embassy
55	Velásquez, Mauricio	Municipal government of Guayaquil
56	Villegas, Tania	Independent
57	Villón, Carlos	Guayas-Los Río-El Oro Regional Forestry District, MAE
58	Viteri, Carlos	Environmental Management Unit
59	Vogel, Joseph	University of Puerto Rico, Río Piedras
60	Zambrano Nelson, Rafael Angel	DarwinNet

#### Appendix 4 List of People Consulted

##### A. List of experts interviewed by assessment team and their institutions

	Name	Institution
1	Aguirre, Zhofre	Herbarium Director, University of Loja
2	Andrade, Max	GTZ, Gesoren
3	Asanza, Mercedes	Nature and Culture International, Loja
4	Avilez, José	President, CONFENAIE
5	Borman, Randy	Fundación Cofán
6	Cedeño, Rocio	USAID/Ecuador EDGE

7	Cruz, René	AIMA
8	Cueva, Eduardo	Nature and Culture International, Loja
9	Encalada, Marco	OIKOS
10	Espinoza, Germán	Forestry Director, Ministry of the Environment
11	Factos, Miriam	Director, SNAP-GEF Project, Ministry of the Environment
12	Farr, Kenneth	USAID/Ecuador DGCP
13	Fernández, José Luís	Ecolex
14	Guillen, Edgar	USAID/Ecuador EDGE
15	Hofstede, Robert	Páramo Project & International Potato Center
16	Lasso, Sergio	Ministry of the Environment
17	Lloret, Pablo	Director, FONAG (National Water Fund)
18	Lozano, Pablo	Independent consultant
19	Manosalvas, Rossana	EcoCiencia
20	Mason, Douglas	USAID/Ecuador EDGE
21	McColm, Michael	Director, Jatun Sacha Foundation
22	Montenegro, Fernando	Fundación Durini
23	Moore, Thomas	USAID/Ecuador DGCP
24	Morales, Manolo	Ecolex
25	Neill, David	Missouri Botanical Garden
26	Ramos, Hugo	USAID/Ecuador DGCP
27	Ríos, Montserrat	Director, Biodiversity, Protected Areas and Wildlife, Ministry of the Environment
28	Stegeman, Gerben	Director, South America Office, International Network of Bamboo and Rattan (INBAR)
29	Tabo, Egeberto	COICA
30	Velarde, Bernai	USAID/Ecuador EDGE
31	Zuquilanda, Monica	USAID/Ecuador EDGE

B. List of expert participants in two-hour workshop, USAID, Feb 16, 2006

Alfredo Carrasco  
 Jorge Albán  
 Roberto Ulloa  
 Marco Encalada  
 Hans Thiel  
 Ruth Elena Ruíz

Manolo Morales  
 Doug Mason  
 Monica Zuquilanda  
 Edgar Guillén  
 Tom Rhodes  
 Paola Závala

## Appendix 5 Protected Areas in the Ecuadorian National System of Protected Areas

The 33 protected areas in Ecuador that conform the National System of Protected Areas (SNAP), their area (ha), location, year of establishment, and the status of their respective Management Plans

No.	Protected Area	Area (ha)	Location (Provinces)	Year established	Management Plan Status	Year updated
1	Cajas National Park	28,808	Azuay	1996	Updated	2004
2	Galapagos National Park	693,700	Galapagos	1936	Updated	2005
3	Galapagos Marine Biological Reserve	7,000,000	Galapagos	1998	Updated	2005
4	Antisana Ecological Reserve	120,000	Napo, Pichincha	1993	Updated	2003
5	Arenillas Ecological Reserve	14,283	El Oro	2001	Updated	2003
6	Mache-Chindul Ecological Reserve	70,000	Esmeraldas, Manabí	1996	Updated	2005
7	Sangay National Park	517,765	Cañar, Chimborazo, Morona-Santiago, Tungurahua	1979	Administrative Plan	2004
8	Yasuní National Park	982,000	Napo, Pastaza	1979	Administrative Plan	2003
9	Cotopaxi National Park	33,393	Cotopaxi, Pichincha, Napo	1975	Update in process	2006 (1996)
10	Llanguanates National Park	219,707	Cotopaxi, Napo, Pastaza, Tungurahua	1996	Out of date	1996
11	Machallilla National Park	55,059	Manabí	1979	Update in process	2006 (1998)
12	Podocarpus National Park	146,280	Loja, Zamora, Chinchipe	19982	Out of date	1997
13	Sumaco National Park	205,249	Napo	1994	Out of date	1996
14	Limoncocha Biological Reserve	4,613	Sucumbíos	1985	Out of date	1988
15	El Angel Ecological Reserve	15,715	Carchi	1992	Out of date	1994
16	Cayambe-Coca Ecological Reserve	403,103	Imbabura, Pichincha, Napo, Sucumbíos	1970	Out of date	1998
17	Cayapas-Mataje Ecological Reserve	51,300	Esmeraldas	1995	Out of date	1998

No.	Protected Area	Area (ha)	Location (Provinces)	Year established	Management Plan Status	Year updated
18	Cotacachi-Cayapas Ecological Reserve	204,420	Esmeraldas, Imbabura	1968	Update in process	2006 (1983)
19	Manglares Churute Ecological Reserve	49,984	Guayas	1979	Out of date	1996
20	Pululahua Geobotanical Reserve	3,383	Pichincha	1966	Out of date	1990
21	Chimborazo Faunistic Reserve	58,560	Chimborazo, Bolivar, Tungurahua	1987	Out of date	1986
22	Cuyabeno Faunistic Reserve	603,380	Sucumbíos, Napo	1979	Out of date	1993
23	El Boliche Recreational Area	227	Cotopaxi	1979	Out of date	1995
24	Cofan-Bermejo Ecological Reserve	55,451	Sucumbíos	2002	None	--
25	Los Ilinizas Ecological Reserve	149,900	Cotopaxi, Pichincha	1996	None	--
26	El Salado Mangrove Faunistic Production Reserve		Guayas	2003	None	--
27	Paschoa Wildlife Refuge	500	Pichincha	1996	None	--
28	Muisne Estuary & Mangrove Wildlife Refuge		Esmeraldas	2003	None	--
29	Corazon Island & Las Fraguas Island Wildlife Refuge	800	Manabí	2002	None	--
30	Santa Clara Island Wildlife Refuge	46	El Oro	1999	None	--
31	La Chiquita Wildlife Refuge	809	Esmeraldas	2003	None	--
32	Parque-Lago National Recreation Area		Guayas	2002	None	--
33	El Condor Binational Park	2440	Morona-Santiago	1999	None	--

Source: Ministry of the Environment, 2005 and updates [10 Feb 06] from the Office of the Director of Biodiversity, Natural Areas and Wildlife

**Appendix 6 Partial List of Ecuadorian Environmental Non-Government Organizations**

Central Ecuatoriana de Servicios Agrícolas (CESA)	Fundación Defensa y Conservación Ecológica de Intag (DECOIN)
Centro de Datos para la Conservación (CDC)	Fundación Ecoenergía
Centro de Derechos Económicos y Sociales (CDES)	Fundación Ecológica Forestal Ecuatoriana (FEF)
Centro de Educación y Promoción Popular (CEPP)	Fundación Ecoturística FECOTUR
Centro de Investigación de los Movimientos Sociales del Ecuador (CEDIME)	Fundación Ecuatoriana de Defensa del Consumidor (FEDECON)
Centro Nacional de Investigaciones Sociales y Educativas (CENAISE)	Fundación Ecuatoriana de Estudios Ecológicos (EcoCiencia)
Colegio de Ciencias Ambientales, Universidad San Francisco de Quito	Fundación Ecuatoriana de Manejo Ambiental (FEDIMA)
Comisión Ecuatoriana de Derecho y Ecología (CEDE)	Fundación Etnoecológica y Cultural Tsantsa
Comité Ecológico del Litoral	Fundación Futuro Verde
Coordinadora Ecuatoriana de Agroecología (CEA)	Fundación Gaia-Tierra Viva
Corporación Centro Ecuatoriano de Derecho Ambiental (CEDA)	Fundación Huancavilca
Corporación de Conservación y Desarrollo (CCD)	Fundación Illihuailla – Mujer, Ecología y Desarrollo (IMED)
Corporación de Defensa de la Vida (CORDAVI)	Fundación Jatun Sacha
Corporación de Estudios de Estructura y Administración del Estado (ESTADE)	Fundación Maquipucuna
Corporación de Gestión y Derecho Ambiental (ECOLEX)	Fundación Natura
Corporación Ecológica Forestal Condor del Antisana (CEFCA)	Fundación Nicolás Vavilov
Corporación Ecuatoriana de Investigación y Servicios Educativos (CEISE)	Fundación para el Desarrollo Alternativo (FUNDEAL)
Corporación Nacional de Bosques Privados del Ecuador (Red de Bosques)	Fundación Pedro Vicente Maldonado
Corporación Ornitológica del Ecuador (CECIA)	Fundación Pro-Bosque
Corporación para el Desarrollo de la Producción y el Medio Ambiente Laboral (IFA)	Fundación Protección del Venado, Soche y Medio Ambiente (PROTEVS)
Corporación para la Gestión Científica y Tecnológica sobre el Ambiente (OIKOS)	Fundación Rumicocha
Corporación SAAR-ENTSA Ecu-Amazonia	Fundación Sinchi Sacha
Corporación Tierra Viva	Fundación Zoológica del Ecuador
Fundación Alternativas para el Desarrollo Sostenible en el Trópico (ALTROPICO)	Genesis
Fundación Ambiente y Sociedad	Observatorio Socioambiental de la Amazonía
Fundación Antisana (FUNAN)	Red Agroforestal Ecuatoriana (RAFE)
Fundación Arcoiris	Savia Nueva, Fundación para la Defensa de la Biósfera
Fundación Cabo San Francisco (FCSF)	Sociedad Ecuatoriana de Medicina Ecológica (SEME)
Fundación Cerro Verde	Sociedad Protectora del Medio Ambiente (SOPROMA)
Fundación Charles Darwin para las Islas Galápagos	Vida Urbana



Fundación de Defensa Ecológica (FUNDECOL)	WildAid
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## Appendix 7 Original vs. actual vegetative cover in Ecuador

A large part of these natural ecoregions has been converted by humans for colonization, agricultural use and to provide water for irrigation. As well, natural forests have been heavily exploited for their timber and non-timber forest products. The southern coastal forests have been hit hardest: according to Dodson & Gentry (1991) who estimated that only 4.4% of the original forest cover remained, and that reflects the land cover status fifteen years ago. Over the entire Ecuadorian coastal plain, Sierra (1999b) calculated an average of 31.6% of natural vegetation remaining ca. 1996, including forest and non-forest cover; the lowland evergreen forests had been the most heavily converted with only 18.3% of its original area still remaining (Table 22).

**Table 22 Coastal region: Original vegetation cover and percentage remaining**

<b>Ecoregion / natural formation</b>	<b>Original land cover (ha)</b>	<b>% remaining 1996</b>
Mangrove	269,900	52.9
Mangrove (small species)	8,242	94.2
Lowland flooded evergreen forest	2,313	92.1
Lowland evergreen forest	3,171,000	18.3
Foothill evergreen forest	1,141,727	36.8
Coastal range foothill evergreen forest	404,263	39.6
Coastal range low montane evergreen forest	15,714	67.4
Coastal range low montane cloud forest	62,293	54.9
Lowland semi-deciduous forest	644,217	23.3
Foothill semi-deciduous forest	524,131	42.1
Lowland deciduous forest	1,298,138	31.1
Foothill deciduous forest	63,399	65.4
Savanna	233,782	71.3
Lowland dry scrub	363,872	68.4
Lowland herbaceous vegetation	20,716	46.9
Total	8,223,707	31.6

Source: Sierra 1999b

The Andes of Ecuador are formed by two major ranges, the Cordillera Oriental (eastern range), the Cordillera Occidental (western range), the steep slopes on both sides of both ranges and the heavily populated inter-Andean valleys. The permanent snow line is today about 5000 m elev. in the face of pronounced glacial retreat due to global warming, and the Andes become lower and have no permanent snow towards the southern border of the country. Both mountain ranges are volcanic in origin creating very fertile valley soil, hence the montane forests lining these valleys are those that have suffered greatest conversion for agriculture, especially on the western range and the western slope of the eastern range (Table 23).

**Table 23 Andean region: Original vegetation cover and percentage remaining**

<b>Ecoregion / natural formation</b>	<b>Original vegetative cover (ha)</b>	<b>% remaining 1996</b>
Low montane evergreen forest, western range	545,247	46.1
High montane evergreen forest, western range	607,504	48.2
Low montane evergreen forest, north-central eastern range	331,804	53.7
Low montane evergreen forest, south eastern range	349,681	75.2
High montane evergreen forest, eastern range	937,425	63.2
Montane cloud forest, western range	949,332	49.1
Montane cloud forest, eastern range	902,935	76.7
Low montane semi-deciduous forest, western range	188,641	26.8
Montane humid scrub, north-central Andes	484,983	24.6
Montane humid scrub, southern Andes	133,574	75.3

<b>Ecoregion / natural formation</b>	<b>Original vegetative cover (ha)</b>	<b>% remaining 1996</b>
Low montane dry scrub	26,722	71.5
Montane dry scrub, north-central Andes	214,808	27.4
Montane dry scrub, southern Andes	297,387	27.8
Páramo with <i>Puya</i>	54,728	82.7
Páramo with cushion plants	115,466	98.2
Páramo with cushion plants and shrubs	53,087	96.9
Páramo grassland	1,173,038	72.8
Dry páramo	183,133	47.8
Montane grassland	855	25.1
High montane grassland	3,139	62.3
Frozen ground	7,501	90.2
Permanent snow	23,247	98.3
Total	7,540,990	57.3

Source: Sierra 1999b

The Amazon region covers about half of the area of the country yet corresponds to only about 2% of the entire Amazon Basin. The westernmost fringe of the Amazon, particularly at intermediate elevations between 500-1500 m, has been identified as a belt of particularly high floristic diversity due to the convergence of Andean elements, Amazonian species and plant species that are found only within that altitudinal range. This low montane region – or high jungle – is also subject to high rates of deforestation that threaten many organisms with extinction in this biodiversity “hotspot.” Deforestation accelerated in the Ecuadorian Amazon during the 1960s with the beginning of the oil boom that attracted colonists from other parts of the country to work for the oil companies and farm the sparsely inhabited land (MAE, EcoCiencia & UICN 2001). According to Sierra (1999b), in 1996, the Ecuadorian Amazon had lost about 16% of its original forest cover, particularly in foothill evergreen forest and várzea forest along riverbanks. Other sources cite much more drastic figures for loss of Amazon forests in Ecuador.